The Manitoba
Cancer Treatment
and
Research Foundation

Annual Report for the Year 1984

1984 ANNUAL REPORT

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W. L. Milne, Esq.
Chairman
The Manitoba Cancer Treatment
and Research Foundation

Sir:

It is my pleasure to submit to you the Annual Report of the Manitoba Cancer Treatment and Research Foundation for the year 1984. There were two changes in Board Membership during the year. Dr. Nancy Gemmell left the Board of the Foundation after serving as a Member since 1976. The Foundation acknowledges with sincere gratitude her dedication and support.

It is with great pleasure that we extend a warm welcome to Mr. D. McMullen who joined the Board during the year.

The body of the report documents the activities of patient care, support services, education and research during the year. Also included are the cancer incidence and mortality figures for the Province for 1984.

Again it is a sincere pleasure to acknowledge the support of a dedicated staff who carry out the functions of the Foundation.

Respectfully submitted,

L. G. Israels, M.D.
Executive Director

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

BOARD OF DIRECTORS

W. L. Milne, *Chairman*

A. Bishop, M.D.
R. G. Cook
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J. W. Enns, M.D.
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G. Campbell MacLean, Q.C.
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J. Rodie
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Ex Officio

The Honorable L. L. Desjardins
Minister of Health & Social Development

R. L. Cooke, M.D. *Chairman,*
Advisory Medical Board

FINANCE COMMITTEE

D. McMullen, *Chairman*
R. G. Cook
W. L. Milne
G. Campbell MacLean
W. Parrish
J. Rodie

ADVISORY MEDICAL BOARD

R. L. Cooke, B.Sc., M.D., F.R.C.S. (C) *Chairman*
W. Beecroft, M.D., D.D.S. (Tor.), F.R.C.S. (C)
D. M. Bowman, B.Sc., M.D.
A. L. Davidson, M.D., M.B., Ch.B., F.R.C.S. (C)
J. Foerster, M.D., B.Sc. (Med) (Man.)
P. A. Galbraith, M.Sc., M.D., F.R.C.P. (C), F.A.C.P.
J. M. Gillies, M.D., L.R.C.P. & S.E., L.R.F.P.S.G., F.R.C.P. (C)
J. P. Maclean, M.D., F.R.C.P. (C)
L. Murray, M.D., MPH
I. C. Peever, M.D., F.R.C.S. (C)
E. W. Ramsey, M.D., F.R.C.S., (Ed.), F.R.C.S. (C)
S. Shalev, Ph.D.
B. H. Weinerman, M.D., F.R.C.P. (C)

MANITOBA INSTITUTE OF CELL BIOLOGY BOARD OF MANAGEMENT

M. Richard Andison, *Chairman*
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G. J. Goldenberg, M.D.
Justice G. Hall
K. R. Hughes, M.D.
Dean P. K. Isaac
L. G. Israels, M.D.
D. Jessiman
W. L. Milne
V. E. Nelson
J. Wade, M.D.

ADMINISTRATION

Executive Director — L. G. Israels, M.D.
Assistant Executive Director — R. R. Publow
Executive Secretary — J. Singer
Administrative Assistant Finance — I. Birse
Administrative Assistant Personnel — J. Morton
Accounts Payable — M. Nash

PROFESSIONAL STAFF

The Foundation is an integral part of the teaching and research program of the University of Manitoba. Various staff members participate in the undergraduate oncology program, teach on the hospital wards, and have graduate students in their laboratories.

UNIVERSITY APPOINTMENTS
- **Faculty of Medicine**
  - Department of Anatomy
    - Dr. G. Froese, *Associate Professor*
  - Department of Biochemistry
    - Dr. L. G. Israels, *Adjunct Professor*
  - Department of Immunology
    - Dr. F. Paraskevas, *Professor*
    - Dr. A. Greenberg, *Associate Professor*
    - Dr. D. A. Chow, *Assistant Professor*
  - Department of Internal Medicine
    - Dr. G. J. Goldenberg, *Professor*
    - Dr. L. G. Israels, *Professor*
    - Dr. F. Paraskevas, *Professor*
    - Dr. D. Bowman, *Associate Professor*
    - Dr. M. Levitt, *Associate Professor*
    - Dr. B. Schacter, *Associate Professor*
    - Dr. B. Weinerman, *Associate Professor*
    - Dr. A. Begleiter, *Assistant Professor*
    - *Dr. E. Bow, Assistant Professor*
    - Dr. L. J. Brandes, *Assistant Professor*
    - Dr. H. Y. P. Lam, *Assistant Professor*
    - Dr. S. T. Lee, *Assistant Professor*
    - Dr. H. Schipper, *Assistant Professor*
  - Department of Obstetrics and Gynaecology
    - Dr. G. V. Krepart, *Associate Professor*
    - Dr. R. J. Lotocki, *Assistant Professor*

Department of Pediatrics
- Dr. A. Bishop, *Professor*
- Dr. A. H. Greenberg, *Associate Professor*
- Dr. J. M. Gerrard, *Associate Professor*
- Dr. E. D. Israels, *Associate Professor*
- Dr. M. L. Schroeder, *Associate Professor*
- Dr. N. Kobrinsky, *Assistant Professor*

Department of Radiology
- Dr. J. M. Gillies, *Associate Professor*
- Dr. S. Shalev, *Associate Professor*
- Dr. J. E. Bennett, *Associate Professor*
- Dr. G. Froese, *Assistant Professor*
- Dr. D. I. Hodson, *Assistant Professor*
- Dr. W. Huda, *Assistant Professor*
- Dr. K. Malaker, *Assistant Professor*
- Dr. W. McLellan, *Assistant Professor*
- Dr. A. L. Meikle, *Assistant Professor*
- Dr. R. F. Palser, *Assistant Professor*
- Dr. A. Sourkes, *Assistant Professor*
- J. Arenson, *Lecturer*
- P. Dunscombe *Lecturer*
- *P. Hahn, Lecturer*
- T. Lee, *Lecturer*

Department of Surgery
- Dr. E. Ramsey, *Professor*
- Dr. B. J. Anderson, *Assistant Professor*
- Dr. W. Beecroft, *Assistant Professor*

Department of Social and Preventative Medicine
- Dr. N. W. Choi, *Professor*
- Dr. N. A. Nelson, *Associate Professor*
- Mrs. M. F. Moodie, *Lecturer*

Faculty of Science

Department of Physics
- Dr. P. Dunscombe, *Adjunct Professor*
- G. Froese, *Adjunct Professor*
- Dr. W. Huda, *Adjunct Professor*
- T. Lee, *Adjunct Professor*
- R. Palser, *Adjunct Professor*
- Dr. S. Shalev, *Adjunct Professor*

Computer Science
- Dr. M. Laucht, *Associate Professor*

RADIATION ONCOLOGY

Acting Director — K. Malaker, M.D., Ph.D.

B. J. Anderson, M.D., F.R.C.S.(C)
W. A. Beecroft, M.D., F.R.C.S.(C)
J. M. Gillies, L.R.C.P.&S.(E), F.R.C.P.(C), F.A.C.R.
P. Hahn, M.D., Ph.D.
D. I. Hodson, M.A., B.M., B.Ch., F.R.C.P.(C)
W. McLellan, M.B., Ch.B., D.M.R.T., F.R.C.P.(C)
A. L. Meikle, M.B., Ch.B., D.M.R.T.(Ed.), F.R.C.P.(C)

Residents

A. Bains, M.D., K. Vijayaraghavan, M.B., B.Sc.

Fellow

J. Freire, M.D.

Radiobiology

S. Biswas, Ph.D. — Honourary Research Associate
R. M. Das, B.Sc., Ph.D.

Support Staff

C. Campbell, J. Demeulemeester

Orderlies:

J. Pelletier, D. Perreta, R. Villabrille

ST. BONIFACE HOSPITAL UNIT

J. E. Bennett, M.B., Ch.B., Cert. Ther. Rad., D.M.R.T.

Support Staff

C. Einarson, K. Friesen, L. Gilmore, S. Regan, L. Soshycki, N. VanHorne, A. Werbicki

THERAPY EQUIPMENT

Manitoba Cancer Foundation

Therac 40/Sagittaire linear accelerator
4 MV S.H.M. linear accelerator
A.E.C.L. Model F Cobalt 60 beam therapy unit
250 kV x-ray therapy unit
140 kV x-ray therapy unit
Picker simulator
A.E.C.L. Therasim 750 simulator
A.E.C.L. Theraplan treatment planning computer
TAGMED 2450 MH_z hyperthermia unit

St. Boniface Hospital Unit

100 kV superficial x-ray therapy unit
A.E.C.L. Theratron 780 Cobalt unit

EXTERNAL IRRADIATION

At the Foundation, 1,286 new patients were treated and 712 were re-treated.

At St. Boniface Hospital Unit, 245 new patients were treated and 184 were re-treated.

	H.S.C.	S.B.G.H.	Total
Patient Visits	17,413	2,652	**20,065**
Treatments	25,265	4,690	**29,955**

NUMBER OF TREATMENTS WITH RADIOACTIVE SOURCES

	Cesium 137	**Gold Grains**	**Iridium Mould**	**Iridium Implants**	**Beta Applicator**	**Total**
Foundation	106	0	2	11	24	**143**
S.B.G.H.	0	0	0	0	1	**1**
Total	**106**	**0**	**2**	**11**	**25**	**144**

The Radiation Oncology service is based at the Cancer Foundation, to which the majority of patients are referred and where major therapy facilities are located. However, with the opening of the new Cancer Treatment Facility at St. Boniface Hospital, the scope of Radiation Oncology has increased considerably. A new A.E.C.L. Isocentric Cobalt Unit offers superior quality of treatment as compared to the old Eldorado Therapy Unit. Since consultation, follow-up, and Radiation Therapy services have increased at St. Boniface Hospital, installation of a Simulator became essential. Simulation services for Radiotherapy Treatment will be available in the near future. Each staff member rotates through the St. Boniface Unit each week. This arrangement has made greater integration possible between the Foundation and St. Boniface Hospital Radiotherapy services.

In addition, members of the professional staff regularly attend Tumor Rounds at Victoria General Hospital and Misericordia Hospital. At the Cancer Foundation, a Head and Neck Multidisciplinary Clinic takes place weekly and is reported in detail elsewhere. Multidisciplinary Lung Consultation sessions are also held weekly. Surgical Oncology Clinics are held twice weekly and an increasing use is being made of the Procedures Room for minor surgical procedures. The staff maintain a very close liaison with Gynecological Oncology. Intracavitary insertions of cesium are confined to the Health Sciences Centre. Increasing numbers of interstitial implants are also carried out at the Health Sciences Centre.

A move has been taken to increase the academic participation of this unit. This was initiated by appointing an Acting Head of the New Department with a mandate to improve academic standing, encourage research activities with more participation in Undergraduate and Postgraduate teaching.

The Department offers a four year Residency Training Program in Radiation Oncology, which is approved by the Royal College of Physicians and Surgeons of Canada and the American College of Radiolgy. The Department also offers a two year training program in Radiotherapy Technology which continues to attract a very large number of well qualified applicants.

ACADEMIC ACTIVITIES

1. *Radiation Oncology Clinical Conference* — New referrals and new problems are discussed three to four times per week.
2. *Radiotherapy and Radiology Seminars* — Where mainly CT Scans for diagnosis and Radiotherapy Treatment Plans are discussed.
3. *Radiotherapy Treatment Planning Seminars* — Held on alternate weeks.

RESIDENCY TRAINING PROGRAM

Currently there are two residents in training. Dr. K. Vijay returned to our Department after completing one year in Internal Medicine, to start her 3rd year of residency. Dr. Amar Bains joined our Program in July, having had two years of training at Queen's University in Kingston, Ontario. Dr. Gene Wong is currently training at the University of Hong Kong and will join our training program in January 1985.

POSTGRADUATE TEACHING

Dr. Malaker, Dr. Hodson and Dr. McLellan presented a series of seminars on the Principles and Practices of Radiotherapeutics to the residents from Surgery, Gynecology, and Chest Medicine.

UNDERGRADUATE TEACHING

1. *4th Year Medical Elective Program* — Three 4th year students spent one week in Radiation Oncology as a part of their Radiology elective rotation. Drs. Hodson and Malaker also lectured a group of students on Radiation Physics and Radiation Biology.
2. *2nd Year Clinical Skills Teaching* — Arrangements have been made with Dr. D. Klass and Dr. B. J. Kaufman for 2nd year students to rotate through Radiotherapy in 1985.

VISITING PROFESSORSHIP

Dr. Keith Halnan, Director of Radiotherapy and Clinical Oncology at Hammersmith Hospital and Royal Postgraduate Medical School, London, England, spent one week as a Visiting Professor.

PARTICIPATION IN NATIONAL AND INTERNATIONAL CONFERENCES

1. Canadian Association of Radiologists Meeting; Vancouver, British Columbia — Dr. I. Hodson, Dr. J. M. Gillies, Dr. K. Malaker.
2. American Society for Therapeutic Radiology and Oncology Meeting; Washington, D.C. — Dr. W. McLellan, Dr. K. Malaker.
3. American College of Radiology Meeting; Los Angeles, California — Dr. J. M. Gillies.
4. International Conference on Head and Neck Cancer; Baltimore, Maryland — Dr. D. I. Hodson.

CLINICAL AND BASIC RESEARCH: HYPERTHERMIA

Dr. K. Malaker, Dr. G. Froese, Dr. P. Dunscombe

We have continued to accept patients with superficial tumors on low dose radiation and daily hyperthermia using local heat. The control, patient compliance and toxicity remained satisfactory in appropriate cases with superficial tumors.

SUPERFRACTIONATED AND MULTIPLE DAILY FRACTIONATED RADIOTHERAPY

Dr. K. Malaker, Dr. D. I. Hodson, Dr. A. L. Meikle, Dr. W. McLellan, Dr. J. M. Gillies

The superfractionated radiation research clinical setting continues to accrue more patients.

Advanced Head and Neck Cancer:

Assessment of three regimens of multiple daily fractionation and accelerated fractionation revealed a rather severe reaction from hyperfractionation, but the tumor control was found to be superior. A split course hyperfractionated regimen showed improved reaction, but considerably poorer tumor control. The accent is now on accelerated fractionation of radiation of advanced head and neck tumors. This regimen uses 300 rads per day per fraction, twice a day to a total dose of 4200 to 4800, depending on the patient's tolerance. The tolerance is satisfactory, the reaction is considerably less, tumor response seems to be parallel to the superfractionated group. All these three groups require further accrual and evaluation after a longer time interval.

Carcinoma of the Pancreas:

We are continuing to accrue patients with localized carcinoma of pancreas using accelerated fractionation of radiation, i.e. 200 rads twice a day to a total dose of 3000 to 3600 rads. Patient tolerance is satisfactory, however clinical analysis awaits further patient accrual and follow-up.

Cancinoma of the Prostrate:

We continue to accrue localized, advanced carcinoma of the prostate on an accelerated fractionated regimen. The patient is given 200 rads three times daily to a total dose of 4200 rads. The tolerance and acute reaction appear satisfactory. Further accrual and follow-up is required for completion of this pilot work.

RADICAL COMBINED SURGERY/RADIOTHERAPY SANDWICH TECHNIQUE FOR OPERABLE Ca ESOPHAGUS

Dr. K. Malaker

We continue to accrue patients slowly in this pilot study. This technique, which involves a single pre-operative dose of 600 rads to the mediastinum, is followed by esophagectomy. This is followed by post-operative irradiation to the mediastinum to a total dose of 4000 rads in 15 treatments, 800 rads to the abdomen in one treatment and 600 to 700 rads to both paraclavicular areas. There have been no serious complications from this regimen and the short term survival (24 months) seems to be vastly superior to any published report.

RADIOPROTECTIVE EFFECT OF SUPEROXIDE DISMUTASE

Dr. K. Malaker, Dr. D. I. Hodson, Dr. V. Taraska

The radioprotective effect of copper zinc superoxide dismutase supplied by an American company will be tested on patients with carcinoma of the lung who were accepted for radical treatment. This research work has been funded by the Manitoba Chapter of the Canadian Lung Association.

INVESTIGATION OF DELAYED RADIATION REACTION

Dr. K. Malaker

We have continued to accrue, register and document all the patients with significant delayed radiation complications, i.e. neuropathy, fibrosis, nephritis, etc. This is to initiate a further investigation into the genetic response to radiation reaction.

Laboratory Investigations:

Dr. R. M. Das has been appointed as a professional research associate who participates in the investigation of radiobiology of multiple fractionated radiation, radioprotective effect of superoxide dismutase and normal tissue reaction to hyperthermia and radiation. These investigations have already been started with financial assistance from the Manitoba Cancer Foundation. Preliminary findings on the radioprotective effect of superoxide dismutase in irradiated rat lung has been presented at the 47th Annual General Meeting of the Canadian Association of Radiologists in Vancouver in June 1984.

HEAD AND NECK TUMOR CONFERENCE AND CLINIC

Dr. D. Ian Hodson — Co-ordinator

The weekly Head and Neck Clinic, established in 1971, continues. Each Thursday morning staff members from the Manitoba Cancer Treatment and Research Foundation and the Health Sciences Centre, with a special interest and expertise in head and neck oncology, convene. Walk-rounds are held where current in-patient problems are reviewed, following which the formal Conference begins. For each patient the clinical data is presented and then the patient examined. The relevant pathology and radiology is then reviewed, following which discussion takes place aimed at producing a consensus of opinion, in a multidisciplinary setting, for the optimum management course for each patient. The follow-up clinic is held following this Conference. Here, both previously treated patients and often patients undergoing treatment are reviewed, again in a multidisciplinary fashion, allowing the treatment results and complications of all modalities to be appreciated.

During 1984, 103 patients were presented at the formal Conference and a total of 1,401 patient visits were recorded in the follow-up clinic. Once more this represents a substantial increase over previous years. The process of booking patients into the follow-up clinic has been revised and this will hopefully streamline what is a traditionally busy clinic, both for the patients and the physicians.

The formal Conference presentations continue to be chaired in rotation by representatives of the Radiation Oncology and Surgical sections. This system was introduced in 1981 and appears to be successful, allowing greater participation by individual physicians and encouraging clinical co-operation. We would like to take this opportunity to thank Drs. MacEwan and Alguacil for their invaluable help with the Radiology and Pathology portions at the Conference, respectively.

Unfortunately patients with advanced non-resectable disease continue to form a substantial proportion of new patients seen. The Clinic is continuing in its participation with the Princess Margaret Hospital in Toronto in the prospective evaluation of the addition of chemotherapy, 5-Fluorouracil and Mitomycin-C, to radiotherapy for these patients.

Patients not eligible for the above trial are being investigated in a local pilot study of multiple daily fractions of radiation in an attempt to improve their generally poor prognosis.

PUBLICATIONS

Hodson, D. Ian; Malaker, K.; Meikle, A.; Levitt, M.: Pilot Studies of Superfractionated Radiotherapy and Combination Chemotherapy in Limited Oat Cell Carcinoma of the Bronchus. Int. J. Rad. Onc. Biol. Physics **10**, 1941, 1984.

Hodson, D. Ian; Malaker, K.: Pilot Studies in the Use of a Three-Stage Field Reduction Technique and BCNU as a Radiosensitizer in Glioblastoma Multiformae. Proceedings of the Canadian Association of Radiologists, Vancouver, 1984.

Hodson, D. Ian; Malaker, K.: Combination Chemotherapy and Split Course Radiotherapy in Advanced Head and Neck Malignancies. Proceedings of the First International Conference on Head and Neck Cancer, Balitmore, 1984.

Malaker, K.: Multiple Daily Fractionated Radiotherapy for Advanced Head and Neck Carcinoma: Accepted for publication in C.A.R. Journal, June 1984.

Malaker, K.: Management of Localized Esophageal Carcinoma: Accepted for publication C.A.R. Journal, Sept. 1984.

Malaker, K.: Time Dose Fractionation for Radical Radiotherapy of Inoperable Keloids: Clinical Oncology. Accepted Sept. 1984.

ABSTRACTS

Malaker, K.: Central Axis Temperature Measurement during Hyperthermia Treatment. Presented at C.A.R. Meeting in Vancouver, June 1984.

Malaker, K.: Radioprotective Effect of Superoxide Dismutase in Animal Experimental System. Presented at C.A.R. Meeting in Vancouver, Canada, June 1984.

Malaker, K.: Primary Sarcoma of the Central Nervous System. Presented at C.A.R. Meeting in Vancouver, Canada, June 1984.

SURGICAL ONCOLOGY

SURGICAL ONCOLOGY

W. A. Beecroft, D.D.S., M.D., F.R.C.S.(C), F.A.C.S.: B. J. Anderson, M.D., F.R.C.S.(C)

The Surgical Oncology Service at the Manitoba Cancer Treatment and Research Foundation was in a period of evolution during 1984. The surgical oncology clinics were expanded to provide formal clinics on Wednesday and Friday, with consultative service being available on a daily basis. The number of outpatient diagnostic and therapeutic procedures increased. Active participation in the Head and Neck Tumor Conference and Head and Neck Clinic continued. More active participation in the daily functions at the M.C.T.R.F. will hopefully continue and expand in 1985.

M.C.T.R.F. — SURGICAL ONCOLOGY CLINIC — 1984

The Surgical Oncology Clinic continues to provide a consultation service for patients with suspected or proven malignant disease. Investigation, treatment planning and post-treatment follow-up is directed through this clinic. Frequently, multidisciplinary consultations are required to appropriately treatment plan and follow many of these patients. As this multimodality trend in cancer therapy increases close liaison with radiation and medical oncology will become increasingly important. Patients with head and neck, endocrine, breast, melanoma, sarcoma and gastrointestinal malignancies are evaluated, and followed in the Surgical Oncology Clinic. Participation in the National Surgical Adjuvant Breast and Bowel Protocols (NSABP) as well as some melanoma and hopefully soon soft tissue sarcoma NCI(C) studies will continue.

During 1984, with Dr. Anderson's continued participation, numbers of new patients seen increased 33% from 217 in 1983 to 287 in 1984. Follow-up patient visits also increased significantly (56%) from 784 in 1983 to 1,225 in 1984.

The out-patient operating room capability has been extended to now provide flexible nasendoscopy and laryngoscopy, as well as sigmoidoscopy. During 1984, 193 procedures for diagnosis or treatment of various lesions were carried out. These varied from breast biopsies (31), various node biopsies (28) to lip resections (7) and excision skin lesions (107).

Continued improvement in the service provided will hopefully continue to augment the service provided to the medical community for excellence in patient care.

PUBLICATIONS

W. B. Povah, M.D., W. Beecroft, M.D., I. Hodson, M.D., H. Yazdi, M.D. Malignant Lympho-epithelial lesion — The Manitoba Experience. The Journal of Otolaryngology 13:3, 1984.

ONCOLOGY NURSING/TECHNOLOGY

Director of Nursing: Beverley Glenday, R.N., R.T.T., Janice Lutz, R.N.

MEDICAL ONCOLOGY:

N. Johnson, R.N., Senior Nurse
S. Bracken, R.N., L. Friesen, R.N., D. Spak, R.N., S. Switzer, R.N.

Clinical Assistants:
I. DeSousa, G. Harney, L. Jonasson, U. Merck

Clinical Investigation:
J. Lutz, R.N., Protocol Nurse Coordinator
K. McDonald, R.N.

Gynecological Oncology:
I. Chrunyk, R.N.

Pediatric Oncology:
Pat Pruden, R.N.

RADIATION ONCOLOGY:

M. Chambers, R.N., Senior Nurse
J. Kirbyson, R.N., R.T.T., L. Suggitt, R.N., S. Kelly, L.P.N.

Clinical Assistants:
B. Babcock, A. Pope, I. Turnbull

Surgical Oncology:
J. Kostenuik, R.N.

Technical Instructor:
E. Kirk, R.N., A.C.(T)

Supervisor, Treatment Floor:
V. Pruden, R.N., R.T.(T)

Senior Radiotherapy Technologists:
G. Ogilvie, R.N., R.T.(T), J. Wood, R.T.(T), J. Grestoni, R.T.(T)

Radiotherapy Technologists:
K. Fox, R.T.T., J. Lamb, R.T.T., S. Ryder, R.T.T., P. Sparkes, R.T.T.,
T. Sydorchuk, R.T.T., D. Wells, R.N., R.T.T.

Student Radiotherapy Technologists:
H. Doherty, S. Hein, K. McDuffe, D. Swanson, T. Walker (Second Year)
B. Bevis, T. Erwin, D. Hughesman, K. Patterson, K. Wedlake (First Year)

ST. BONIFACE NURSING AND TECHNOLOGY STAFF:

R. Olson, R.N., R.T.(T), Senior Nurse
B. Dodds, R.N., R.T.(T), B. Lucko, R.N., S. Hatton, R.N., R.(T)T.,
S. Sharpe, R.T.(R&T).

ONCOLOGY NURSING/TECHNOLOGY

Nursing/Technology experienced several changes in 1984 with Bev Glenday (November 1983 — March 31, 1984) and Jan Lutz (April 1 — September 31, 1984) appointed interim Director of Nursing, following the retirement of Mrs. Verna Sparks. Mrs. Sparks came to the Foundation in 1949. She became the Chief Nurse Technologist in 1953 and was given the title of Director of Nursing in 1974. The care and support she gave patients and staff during these many years will always be appreciated. Mrs. B. Glenday was appointed Director of Nursing in October 1984.

Our oncology nurses and technologists continue to be committed to their involvement in educational activities. They frequently are guest speakers at rural and urban health institutions as well as participating in our inservice educational sessions. Informative tours of the Foundation are also given by nurses and technologists to designated groups. Senior nursing students from the University of Manitoba and Health Sciences Centre School of Nursing, on an elective basis, spend time in our Medical Oncology unit, under the able direction of Nancy Johnson, as part of their clinical experience. Nurses in their Masters program conduct clinical research at the Foundation.

Oncology nursing has been fulfilling its province-wide mandate for updating and upgrading nurses to work in Oncology. To this end, a two-day lecture series has been established under the auspices of our Outreach Coordinator, Valerie Mann. This program is available (as a continuing education seminar), to registered nurses requiring orientation from the Manitoba Cancer Foundation, the Foundation Outreach Program, the St. Boniface General Hospital Oncology Clinic and all other nurses in the province already involved in administering chemotherapy.

Pediatric nursing, under the able guidance of Pat Pruden, is forging new horizons in caring for pediatric patients and their families. The oncology nurse plays a major role, not only in administration of chemotherapy, but also in the education of the patient, family members, friends, school classmates, and teachers, in regard to the illness, the treatment and any complications that may arise. Pat, along with Joyce Wright (Teacher), eases the children's return to school by visiting the teachers and the classrooms. Pat also continues to play an important role in the home terminal program. Weekly rounds with the pediatric team help in identifying problems in their early stages and planning appropriate remedial measures.

During 1984, Radiation and Medical Oncology nurses have continued to participate in Respiratory Rounds at the Health Sciences Centre Respiratory Centre. This provides continuity of care and improved follow-up of lung cancer patients. Conjoint Nursing/Social Service Rounds are proving to be very beneficial. They provide for excellent interdisciplinary communication and contribute to early referrals to Social Work, providing supportive intervention early in the disease process.

Our clinical nurse specialists provide valuable assistance to Medical Oncologists in clinical evaluation, furnishing the necessary liaison between patient care in the clinic and clinical investigation evaluation and management.

A committee comprised of nursing and pharmacy personnel, together with a representative from the Environmental Office and Waste Management, Province of Manitoba, established acceptable guidelines for the safe handling of antineoplastic agents. The guidelines were approved for use as Nursing Policy and Procedure at the Manitoba Cancer Treatment and Research Foundation. Copies of these guidelines are available to other institutions on request, as a resource in reviewing and establishing their guidelines.

Jan Lutz, Assistant to the Director of Nursing and Supervisor of the Clinical Investigation Office, was a member on the Formative Planning Committee for the Canadian Association of Nurses in Oncology. She was also the nurse contributor to the Health Services Commission Subcommittee investigating and projecting future oncologic needs within the province of Manitoba.

A Nursing Practice Committee was formed to develop our philosophy of nursing, goals, objectives and standards of nursing care. This is a commitment that will take some time to complete.

Katherine Fox, R.T.T., is the Committee on Education corresponding member from Manitoba to the Canadian Association of Medical Radiation Technologists. She is coordinating the revision of the National Radiobiology Syllabus for the Technologists' Training Program.

Elvera Kirk, R.N., R.T.(T), our Technical Instructor, is in her second year of being the Question Bank Coordinator for the Council on Education to the C.A.M.R.T.

Joint Technologists and Technology Development Committee meetings continue to provide meaningful dialogue and important exchange of information between staff members. This contributes to improved treatment delivery.

RADIOTHERAPY TECHNOLOGIST TRAINING PROGRAM

Elvera Kirk

The Manitoba Cancer Foundation, together with Red River Community College, continues to provide persons interested in a health care profession, and specifically in oncology, the opportunity to train and become certified in the field of Radiation Technology.

The Radiotherapy Technologist Training Program changes constantly as we strive to find the appropriate blend of academic and clinical experience which will best provide the technologist with the skills necessary to give competent and empathetic care to our patients. The students who entered the Training Program in September embarked on a somewhat different program format, in that their academic time was divided into two 16-week blocks, separated by a clinical block of 4 weeks. It is anticipated that the opportunity to put theory into practice in the clinical situation, earlier in their training, would enhance both teaching and learning. It goes without saying that an ongoing evaluation program must be in place in order to assess the effects of changes such as this, on the quality of care provided to the radiotherapy patient.

The Education Program Committee, whose purpose it is to ensure effective integration of didactic and clinical segments of the entire program, as well as to provide for continuous evaluation of the various components of the program (format, staff personnel, and students) meets once a month for both dialogue and decision-making. The student representatives continue to provide both new ideas and fresh approaches to the constantly changing area of education.

This year the senior students accepted the responsibility of revising the career brochure relating to the profession of Radiotherapy Technology. New photographs were taken and the script was subjected to major scrutiny and revision in order that it more accurately reflect the program as it is at this time. A special thanks to the members of that class who put forth a fine effort.

The junior class also received the dubious honor of being the first class to be levied a tuition fee. The revenue obtained has been earmarked specifically for audiovisual equipment, both hardware and software, and for special interest seminar registration fees.

In September, four candidates wrote the Canadian Association of Medical Radiation Technologists (C.A.M.R.T.) certification exams and all were successful in obtaining their R.T.(T). Our congratulations to Joan Firby, Leslee Mass, Shelley Wozny and Chris Zeller. In addition, our congratulations to two 1983 graduates who received special recognition in 1984, for performances in 1983. Pamela Sparkes received the L. J. Cartwright Award, national recognition by the C.A.M.R.T., for the best technical essay written by a student. Her paper was entitled, "Nutritional Management of the Radiotherapy Patient". Katherine Suderman received the M.A.M.R.T. Registration Award for highest marks in the national certification examination.

As of December 1984, we had ten students enrolled in this program, five in each year. There is a growing interest amongst the public in our program, evidenced by the fact that we had 58 applications for five student positions available in 1984.

My personal thanks to those staff members who give of their time and expertise so that we can continue to be proud of our graduates as they enter a rewarding and challenging career in Radiation Oncology.

MEDICAL ONCOLOGY

Director — David M. Bowman, M.D., B.Sc.(Med), F.R.C.P.(C)

L. Brandes, M.D., B.Sc.(Med), F.R.C.P.(C)
J. Foerster, M.D., B.Sc.(Med)
G. Goldenberg, M.D., Ph.D., F.R.C.P.(C)
L. G. Israels, B.A., M.D., M.Sc., F.R.C.P.(C)
J. Johnston, M.B., F.R.C.P.(C)
M. Levitt, M.D., M.Sc., F.R.C.P.(C)
B. Schacter, M.D., B.Sc.(Med), F.R.C.P.(C)

CLINICAL FELLOWS

S. Riddell, M.D., F.R.C.P.(C)
R. Nash, M.D.

RESIDENTS

C. Rauscher, A. Lipson, E. Watson, P. Hanly, G. Ginther, K. Rodgers, J. Gomez, J. Jeffrey

INTERNS

S. Valentine, H. Domke

NURSING STAFF

N. Johnson (Senior Chemotherapy Nurse)

Clinical Nurses

S. Bracken, L. Friesen, G. Harney, D. Spak, S. Switzer

Nursing Aides

L. Jonasson, U. Merck, I. De Sousa, L. Thornhill

CLINICAL INVESTIGATION OFFICE

Director — Dr. M. Levitt, M.D., M.Sc., F.R.C.P.(C)
Protocol Nurse Co-ordinator — J. Lutz, R.N.
Protocol Nurse: K. McDonald, R.N.

Protocol Technicians

H. Funk, E. Janke, E. Stiles, D. Svaling, H. Whitaker

Clinic Receptionist

C. Jones

Departmental Secretaries

J. Powell, T. Reutcky

MEDICAL ONCOLOGY

ORGANIZATION

The Manitoba Cancer Treatment and Research Foundation Department of Medical Oncology provides programmes for therapy of adults with neoplastic and hematologic diseases in Manitoba. Patients are also referred from neighbouring provinces and states. Facilities are maintained geographically at the Foundation and at St. Boniface General Hospital (See also report of "Oncology Unit — St. Boniface General Hospital"). The Foundation also coordinates a Cancer Outreach Programme to provide rural patients and their families with optimal standards of care close to their home environment. All Medical Staff have full-time appointments at the University of Manitoba and most are actively conducting programmes of basic research and/or clinical investigation.

The Oncology Centre at the Foundation is an Outpatient facility also housing the research programmes of the Manitoba Institute of Cell Biology, such that basic research, clinical investigation and patient care programmes are intimately related. The Department of Medical Oncology includes eight medical oncologists who provide care for patients with malignant and hematologic diseases. In addition, close liaisons with radiation oncology, gynaecological, urological and surgical oncology, plus pediatric oncology are maintained. The professional team includes oncology nurses specialized in parenteral administration of chemotherapy and immunotherapy. The Radiation Oncology service is also located within the Oncology Centre, thus, facilitating interdisciplinary approaches to cancer care. A hematology laboratory at the Oncology Centre provides hematologic data of high quality promptly and efficiently to all of the clinics as is essential to the ongoing care of both urban and rural patients. Other patient services in the Oncology Centre include a special cancer-oriented Social Service, and Epidemiology and Statistics Section.

Daily multidisciplinary conferences are held to discuss new patient referrals and expedite an efficient consultative service for patients with all forms of malignancy. These outpatient services are integrated with the inpatient services of the adjacent Health Sciences Centre. Thus, when necessary, patients are admitted to the University Ward services of the General Centre (HSC). Here they are cared for by the House Officers and the Oncology Fellows under the supervision of the senior consultant of the Medical Oncology Service. The Medical Oncology Service also provides the Hematology/Oncology consulting service to inpatients of the Health Sciences Centre.

TEACHING

In addition to the service component involved in care of ambulatory patients with neoplastic disease, the Medical Oncology Service provides teaching for students at an Undergraduate level through lectures in Hematology and Oncology, and a laboratory hematology course; and at the graduate level of Interns and Residents in the Department of Medicine. Full-time Clinical Fellows and residents in Internal Medicine rotate on the Hematology/Oncology Service, both at the Health Sciences Centre and St. Boniface Hospital. In addition, they participate in the Clinical and Research Seminars and Rounds of the Department as well as resident Clinical Seminars. All third year undergraduate medical students at the University of Manitoba were given a series of Hematology case reviews under the supervision of various members of the Attending Staff and the Hematology fellows. Some of the fourth year medical students also participated in one-month selectives on the Hematology/Oncology Service.

The Hematology/Oncology Morphology Teaching Laboratory under the direction of Ms. A. Sasyniuk, R.T., B.Sc., participates fully with the Medical Oncology Department including the St. Boniface Hospital Unit, in the teaching of Medical and Pediatric fellows and rotating residents, as well as the fourth year clerks and third year clerks participating in the Hematology/Oncology electives.

The purpose of this laboratory is to:

1. Coordinate the clinical teaching with the laboratory data.
2. Train fellows, residents and clinical clerks in the Hematology/Oncology program to interpret the morphology of the peripheral blood and bone marrows obtained from patients they have seen in clinic or admitted to hospital.
3. Give each clinical clerk during their elective a caseload of patients, representative of the spectrum of ages in normal and disease states. Therefore, providing students with experience to develop efficiency in obtaining relevant history, to recognize life threatening problems and to establish priorities in management in acute and chronic situations.

The schedule provides 4-6 hours/week training in examination of morphology and interpretation of peripheral blood smears, bone marrows and biopsies on a one to one basis. Each student has the opportunity to examine the above material at the time of diagnosis, during treatment, and during remission.

For those who choose to rotate through this program the major emphasis of this laboratory is to integrate and to broaden the understanding in Hematology/Oncology. It also provides an opportunity to gain first hand experience at interpretation of peripheral blood smears and bone marrow smears and a more fuller utilization of useful diagnostic tests.

During 1984 the rotation included 8 trainees in pediatrics, 10 trainees in internal medicine, 11 selective/elective undergraduate student trainees and trainees in pathology.

The excellent teaching in the laboratory is provided by Anne Sasyniuk, assisted by Carol Street, R.T.

The program is an important complementary experience for physicians in Pediatrics or Internal Medicine who will be providing health care in urban or rural centres, as well as those who will pursue an academic career.

Late in 1984 a formal Visiting Professor Programme was initiated, including visits by Doctor Merrill Feldman from Boston University and Doctor Edward Baral from the Karolinska Institute. Support of the Visiting Professor Programme by ICI Pharma and the Upjohn Company of Canada is gratefully acknowledged.

BASIC RESEARCH

The clinical facility on the ground floor of the Oncology Centre is intimately juxtaposed with the Manitoba Institute of Cell Biology which is situated on the second floor of the same building. This relationship allows sophisticated tests and expert consultations to be immediately available from laboratories doing research in tumour immunology, coagulation, and membrane transport of chemotherapeutic agents. See also separate report of the Manitoba Institute of Cell Biology.

CLINICAL INVESTIGATION

New developments in medical therapy of cancer have made the conduct of a clinical investigation programme an integral part of developing cancer treatment programmes. In Medical Oncology, programmes of clinical investigation are carried out both on an independent basis, and in collaboration with major clinical trial co-operative groups.

The Protocol Review Committee, with multidisciplinary membership evaluates clinical investigations involving the Manitoba Cancer Treatment and Research Foundation, composed of Drs. M. Levitt (Chairman), D. Bowman, B. Weinerman, J. Gillies, and L. G. Israels.

The Department of Medical Oncology also participates in clinical trials sponsored by several national and international clinical trial co-operative groups, including the National Cancer Institute of Canada (NCIC — Principal Investigator — Doctor M. Levitt), and the National Surgical Program for Breast and Bowel Cancers (NSABP — Principal Investigator, Doctor D. M. Bowman). Participation in numerous protocols with these co-operative groups and institutions remains a high priority of medical oncology. We believe these multi-institutional co-operative trials represent the forefront of developmental cancer therapeutics. Table I, which follows, indicates our participation in these protocols during recent year.

TABLE I

CLINICAL INVESTIGATIVE PROTOCOL ACCRUAL

Study Group	**1981**	**1982**	**1983**	**1984**
NCIC				
Remaining on Study from prior years	100	137	202	286*
New Patient Accrual	93	113	61	106
Off Study	56	48	39	51
Remaining on Study	137	202	224	341
NSABP				
Remaining On Study from prior years	148	171	221	271
New Patient Accrual	36	68	64	59
Off Study	13	18	14	16
Remaining on Study	171	221	271	314
*LOCAL TRIALS***				
Remaining on Study from prior years	—	28	41	33
New Patient Accrual	—	41	25	35
Off Study	—	28	33	23
Remaining on Study	—	41	33	45
Total on Study (yr. end)	**308**	**464**	**528**	**700**

*Includes 42 patients actually entered in 1983, but not previously (1983 Report) documented.

**Additional palliative trials of symptom control studies (NCIC SC.1, morphine/diclofenac, Ibuprofen analgesia and sustained release morphine trials) accounted for a further 30 patients on study at the end of 1984.

The following is a brief description of current active clinical investigative trials.

Disease Site	Number	Description
Ovarian Carcinoma	NCIC OV.6	Non-randomized study to determine the efficacy of surgery alone in patients with Stage IA or Stage IB disease when extensive surgical staging has been done to confirm limited disease.
Ovarian Cancer	NCIC OV.7	To compare current optimum chemotherapy with abdominopelvic irradiation in Stage IC, IIA, B, C, or III, with microscopic disease. 1. RT to abdomen x 22 treatments and RT to pelvis x 11 treatments VERSUS 2. Cyclophosphamide I.V. and Cis-Platinum I.V. q 4 weeks x 9 courses.
Ovarian Cancer	NCIC OV.8	To compare Carbo-platin plus Cyclophosphamide versus Cis-Platinum plus Cyclophosphamide in patients with macroscopic residual disease. Responders receive 3 more courses of original chemotherapy versus RT to abdomen x 22 treatments and RT to pelvis x 11 treatments.
Lung Cancer	NCIC BR.4	To compare standard versus alternating non-cross resistant chemotherapy in "extensive" small cell carcinoma. 1. Cytoxan I.V., Adriamycin I.V., Vincristine I.V. day 1 only q 3 weeks x 6 courses VERSUS 2. CAV (above) cycles 1, 3, 5 alternating with VP-16 I.V. and Cis-Platinum I.V. daily x 3 days cycles 2, 4, 6. Cycles are q 3 weeks x 6 courses.
Lung Cancer	NCIC BB.5	To compare two chemotherapy regimens and to evaluate changes in "Quality of Life". 1. Vindesine day 1, weekly x 4, then q 2 weeks; Cis-Platinum day 1, day 36, then q 2 weeks VERSUS 2. Cyclophosphamide, Adriamycin, Cis-Platinum q 4 weeks.
Lung Cancer	NCIC BR.6	PENDING

Lung Cancer	NCIC IND.7	To determine the response and toxicity of mesothelioma of lung to mitoxantrone.
Lymphoma	NCIC LY.3	Comparison of Standard BACOP chemotherapy with Escalated BACOP in "poor prognosis" histology.
Lymphoma	NCIC IND.16	To investigate the effectiveness of Acivicin (AT-125) in patients with poor prognosis, non-Hodgkin's lymphoma in whom conventional treatment(s) are ineffective.
Hodgkin's Disease	NCIC HD.4	To study the effectiveness of MOPP/ABV Hybrid chemotherapy versus alternating MOPP/ABVD for remission induction, durability and survival in advanced or recurrent disease.
Chronic Lymphatic Leukemia	M.CLL.82.1	To determine the response rate of patients with refractory C.L.L. to weekly doses of 2'-Deoxycoformycin (Phase II).
Multiple Myeloma	NCIC MY.3	Pilot study of weekly CTX and Prednisone for patients unresponsive to Melphalan and Prednisone therapy.
Multiple Myeloma	N.MY.84.1	Pilot study of weekly cyclophosphamide and alternate day Prednisone therapy (CWAP) as primary treatment in multiple myeloma, stages 1 to 4.
Malignant Melanoma	NCIC ME.5	Surgical study to determine the safest excision margins around the primary melanoma and to evaluate the management of the regional lymph nodes. A national intergroup protocol.
Malignant Melanoma	NCIC IND.14	To determine the efficacy of N-Methylformamide in malignant melanoma.
Colon Carcinoma	NSABP C-02	To evalute postoperative portal vein infusion of 5-FU in resectable adenocarcinoma of colon.
Rectal Carcinoma	NSABP R-01	To compare no treatment versus combination chemotherapy versus radiotherapy in patients with Duke's B or C rectal carcinoma after surgery.
Breast Carcinoma	NCIC MA.4	To compare Tamoxifen versus Tamoxifen plus combination chemotherapy in patients with ER *or* PR positive stage II breast carcinoma. To compare no treatment versus combination chemotherapy in patients with ER *and* PR negative stage II breast carcinoma.

Breast Carcinoma	NSABP B-13	To compare no treatment versus combination chemotherapy in patients with ER and PR negative stage I breast carcinoma.
Breast Carcinoma	NSABP B-14	To compare placebo versus Tamoxifen in patients with ER *or* PR positive stage I breast carcinoma.
Breast Carcinoma	NSABP B-15	To compare Adriamycin plus Cyclophosphamide versus Cyclophosphamide plus Methotrexate plus 5-FU versus both regimens sequentially in patients with *PR negative* stage II breast carcinoma.
Breast Carcinoma	NSABP B-16	To compare no chemotherapy versus Adriamycin plus Cyclophosphamide versus Melphalan plus 5-FU in patients with *PR positive* stage II breast carcinoma.
Colorectal Carcinoma	NCIC IND.8	To determine the efficacy of N-Methylformamide in patients with colorectal carcinoma.
Colorectal Carcinoma	M.CR.84.2	To determine efficacy of Methotrexate and 5-FU (with leukovorin rescue) in patients with advanced colon or rectal carcinoma.
Laryngeal Carcinoma	M.H&N.82.1	To compare radiotherapy versus radiotherapy plus combination chemotherapy in patients with advanced carcinoma of larynx or hypopharynx without distant metastases.
Head & Neck Carcinoma	M.H&N.84.3	To determine efficacy of high dose Methotrexate plus PaLa chemotherapy in patients with advanced head and neck carcinoma.
Sarcoma	M.SA.80.1	To determine whether Metronidazole is synergistic with Adriamycin in patients with advanced soft tissue sarcoma.
Supportive Care Protocols	NCIC IC.4	To assess the role of the antibiotic azthreonam and to determine the optimal duration of therapy in responding patients in febrile patients with neutropenia secondary to chemotherapy.
Supportive Care Protocols	M.SC.84.4	To determine the effectiveness of Droperidol in patients with persistent chemotherapy related nausea and vomiting.
Supportive Care Protocols	M.Sc.83.9	To compare sustained release morphine tablets versus oral morphine liquid in cancer analgesia.

MEDICAL ONCOLOGY NURSING

Medical Oncology Nursing at the Foundation is ably led by Nancy Johnston in the Chemotherapy Clinic with a staff of five chemotherapy nurses devoted to the education, support, and particularly expert administration of parenteral chemotherapy for their patients; and by Janice Lutz, Protocol Nurse Co-ordinator and Protocol Nurse Kerry McDonald in the Clinical Investigation Office.

Medical Oncology Nurses participate in Respiratory Rounds with the staff at the Respiratory Centre to improve follow-up care of lung cancer patients. Similarily, regular Nursing Conjoint Rounds with Social Service have been beneficial in identifying high risk situations and intervening with appropriate measures to prevent crisis development. Increasing awareness of the role of the oncology nurse by the University of Manitoba and Health Sciences Centre Schools of Nursing has been evidenced by placement of senior nursing students at the Foundation as part of their clinical experience. Education in the wider community continues to be encouraged and medical oncology nurses lecture programmes continue to attract nursing attendance from throughout the province. The nursing staff also frequently act as guest speakers at other urban and rural health institutions. Continued participation in national and international oncology meetings enhances skillful evaluation and counselling for patients and their families.

Our two nurse oncologists who completed the Faculty of Medicine second year undergraduate programme in physical diagnosis previously are proficient in assisting medical oncologists in clinical evaluation of patients at the Oncology Centre, and in addition provide a critical liaison between patient care in the clinic and clinical investigation (protocol) activities including evaluation of patients with respect to eligibility, informed consent, and on-going assessment during therapeutic trials. Nursing research is fostered in conjunction with the University of Manitoba School of Nursing and with National Cancer Institute, National Surgical Adjuvant Breast and Bowel Programme, as well as institutional protocols.

PATIENT CARE

Optimal patient care is in the primary objective of the Department of Medical Oncology. The Medical Oncology Clinic, in conjunction with the unit at St. Boniface Hospital, serves as the Manitoba referral centre for care of patients with neoplastic and hematologic diseases. The adult clinic also operates in close co-operation with active pediatric oncology clinics, which are reported in detail elsewhere in this Report. While the clinic itself is strictly an ambulatory (outpatient) facility, all attending oncologists hold major University of Manitoba appointments and are on active staff at the contiguously adjacent General Centre of the Health Sciences Centre. Accordingly patients requiring admission to Hospital are admitted to the General Centre where they are attended in continuity by their medical oncologist.

Concordant with recent guidelines for medical oncology training programmes accepted by the Royal College of Physicians and Surgeons of Canada, the Manitoba Cancer Treatment and Research Foundation Board has reiterated to the Health Sciences Centre its recommendation to establish a geographic inpatient oncology unit to serve as a centralized inpatient hematology/oncology unit.

Table II illustrates the ambulatory (out-patient) services: (See also separate report for St. Boniface Hospital Unit)

TABLE II
MCF MEDICAL ONCOLOGY PATIENTS

New Patients		Follow-up Visits to Doctor		Total Physician Visits		Number of Treatment Courses	
1983	**1984**	**1983**	**1984**	**1983**	**1984**	**1983**	**1984**
293	287	5,107	5,125	5,400	5,412	3,269	3,584

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PEDIATRIC ONCOLOGY

Section Head — A. J. Bishop, B.Sc., M.D., F.R.C.P.(C)

J. G. Gerrard, M.D.C.M., Ph.D., F.R.C.P.(C)
E. D. Israels, B.A., M.D., M.Sc.
N. L. Kobrinsky, B.Sc.(Med.), M.D., F.A.A.P., F.R.C.P.(C)
M. L. Schroeder, M.D., F.R.C.P.(C)

ONCOLOGY NURSE

P. Pruden, R.N.

HOME CARE CO-ORDINATOR

K. McRae, R.N.

SOCIAL WORKER

S. Powell, B.S.W.

PLAY CO-ORDINATOR

W. Leslie

TEACHER

J. Wright, B.A., B.Ed.

DATA MANAGERS

D. Svaling, M.R.T., H. Whitaker, M.R.T.

CHAPLAIN

A. Goodwin, B.Sc.N., M.Div.

FELLOW

S. Israels, M.D., F.R.C.P.(C)

RESIDENTS

T. Klassen, S. McKenzie, M. London, C. Baxter,
K. Darville, M. Johnston

SUPPORT STAFF

J. Powell

PATIENT CARE

As in previous reports, most of this section will centre on the various support systems available for the pediatric oncology patient, since these resources are essential components for the therapy of children with cancer. Modern therapeutic approaches have resulted in successful therapy for just over one-half of all pediatric patients with cancer. With these improvements in outcome of therapy, those involved in the care of children with cancer must focus attention not only on treating the disease, but also on the long term effects of therapy on the physical, psychosocial and developmental aspects of the patient and their families. Without these essential support groups we would be unable to reach the goal of a normal child at the end of successful treatment and would fail in our therapeutic mandate, even if we cured the cancer.

The Pediatric Section is the primary referral centre for children with oncological diseases for the Province of Manitoba, and has developed a comprehensive care program for the pediatric patient with cancer. This type of program requires treatment and support services beyond the scope of any one institution. Out-patient services are co-ordinated through the Cancer Foundation, and in-patient care is co-ordinated through the Children's Hospital.

To provide continuity of care the same personnel from the treatment team, such as pediatric oncologist, social worker, oncology nurse, home care co-ordinator, play therapist, teacher and chaplain are responsible for directing the treatment program of the individual patient, whether the care setting is out-patient, in-patient or home.

Under the direction of Pat Pruden the role of the pediatric oncology nurse continues to expand. The oncology nurse plays a major role, not only in the administration of chemotherapy, but also in the education of the patient and his or her family, friends and school in regard to the illness, therapy and complications of therapy. She also provides in-service educational sessions for paramedical personnel, who participate in the care of the child with cancer, and co-ordinates weekly meetings of the entire treatment team. She also plays an essential role in the home-terminal program. As ambulatory therapy and support continues to expand, both in quantity and complexity, so does the role of the pediatric oncology nurse. If the high standard of care is to be maintained, and if programs are to be expanded as needs are recognized and solutions to these needs are to be developed, then expansion in our pediatric oncology nurse program will be required.

The psychosocial support services continue to be provided by one social worker, Susan Powell, from the Children's Hospital. The service fully recognizes that a life-threatening illness in a child has major implications for the entire family. Therefore, every family has an opportunity to meet with the social worker and should the need arise, counselling services are provided for the patient and other members of the family. Crises prevention is an important aspect of this support service.

The social worker provides an essential liaison role with the Children's Hospital and community resources which can assist families with practical and emotional support. She assists in organizing information meetings for new families to familiarize them with the clinic and staff.

The establishment in 1983 of the Teen Group, a self-help group for teenagers with cancer, has been expanded in 1984. This program has been very successfully and professionally directed by the social workers, as evidenced by the positive response toward the program by the teenaged patients who utilize it. The social worker also provides support and information to the parent self-help group. This group "Jeffrey's Folks" provides one-to-one support for any parent of a child newly diagnosed with cancer, who would like to meet and talk with another parent who has experienced having had a child with cancer.

Play therapy, under the direction of Winn Leslie, from the Child Life Section of the Children's Hospital, continues to be an extremely important aspect of the young patient' visits to the Foundation Clinic. This program reduces the anxiety of both patient and parents and also allows siblings to participate in the activities of the clinic. Through play, our highly sophisticated puppets, specifically designed to demonstrate such common procedures as intravenous therapies, punctures, marrow aspirations, surgical procedures and complications of therapy greatly enhance the young child's understanding of his or her illness. In addition, the play therapy program allows the therapy team to augment our knowledge of the patient's response to their disease or treatment, since the young child frequently tells us more through play than they are capable of verbalizing.

The need to provide a wide range of educational services for students receiving treatment at the Cancer Foundation has been recognized for some years. Teachers at the Children's Hospital co-operate fully in providing this support, but the needs outgrew the resources as more and more patients were being treated as out-patients. As reported last year, it became evident that a specific teacher to directly address these concerns was required. With the financial support of the Canadian Cancer Society and with the co-operation of the Department of Education and Winnipeg School Division No. 1, a half-time teaching position was established in April, 1983. The Section is pleased to report the application made in the spring of 1984 to the Department of Education for funding of this position was successful. Joyce Wright continues to effectively fill this position and develop a model based upon service delivery needs and demands. This model is now also being used for other pediatric patients with chronic illnesses. Enquiries concerning the development and function of this program are being requested from other centres in both Canada and the United States.

Children who are under the care of the Cancer Foundation are strongly encouraged to carry on as normal a lifestyle as possible, including regular school attendance. On occasion due to distance from home or complexity of treatment this is not possible. These children are kept current in their school program, either by provision of one-on-one tutoring by the oncology teacher, or where it is appropriate to involve the child in a classroom setting (especially the younger child who needs group activities) the child is introduced into the classroom at Children's Hospital.

The teacher maintains an on-going liaison with the home school, and in addition, visits the patient's school often with the oncology nurse and social worker. The objective of these visits is to help both teachers and classmates understand and be more comfortable with the child with cancer. Each visit is designed to meet the needs of a particular situation. The home school may draw upon administration, resource teachers, guidance personnel, and special education co-ordinators. We are grateful to the Canadian Cancer Society for providing the funds for the travel required to the rural schools.

The oncology teacher, nurse and social worker will also visit, if requested, classrooms of children who have died to discuss death and grieving with students and teachers.

Entire classes have visited the clinic area. When treated as any other field trip the youngsters have learned a great deal and are sensitized in a non-threatening manner. They have the opportunity to view an examination room, the medical instruments and equipment and receive an explanation or demonstration of procedures. The classmates gain an understanding of the clinic environment, and an appreciation of what the classmate, the patient, experiences. The patient benefits greatly from the increased understanding of his classmates. For both, much of the mystique and fear has vanished. Very positive feedback has occurred from these field trips by both students and teachers. Teachers have commented on how easily the children were able to discuss cancer, a topic, which for many adults is unfortunately on a hush list. This program also fulfills the important role of the Foundation in educating the public. With the co-operation of the Cancer Foundation, the Children's Hospital and Winnipeg School Division No. 1, workshops for teachers in the province who have children with cancer in their classrooms, are now an annual event.

The school program is an excellent example of how the needs of pediatric patients with cancer expand beyond the traditional medical institutions and medical personnel and health personnel. The Section appreciates the positive response received from the Provincial Department of Education and, in particular, Winnipeg School Division No. 1 in seeking methods and resources for meeting these needs.

We continue to be grateful for the support service given to the staff, patients and their families by the chaplaincy of Reverend Ann Goodwin. The role of hospital chaplains in the pediatric oncology program is also one which is challenging and one from which we are gaining an understanding of the spiritual needs of children.

The Section is particularly pleased to report that the Ronald McDonald House, a facility which provides "a home away from home" for the rural families undergoing therapy in Winnipeg was opened in the spring of 1984. The many parents, patients, members of the therapy team and administration representatives of the Children's Hospital who gave much time and energy in the establishment of this House, continue to play a large role in its maintenance. This facility has enriched our program and has added greatly to the support system of our rural patients.

Debbie Svaling and Heather Whitaker fulfilled the ever-increasing important role of data collection for the various treatment protocols of the Section. The Section would be unable to meet its clinical investigation role without the excellent work of these individuals.

Full support is available from the Department of Pediatrics, University of Manitoba, for essential sub-specialties, such as immunology, allergy, infectious disease, neurology, genetics, endocrinology, surgical sub-specialties, metabolism, nutrition and child development.

The Section is grateful for the support and co-operation of Administration of the Foundation, the Children's Hospital and the Winnipeg School Division No. 1, in allowing personnel to cross institutional, geographical and functional boundaries, since, without this support, true comprehensive care for the pediatric oncology patient would not be possible. The Section also is grateful to the Canadian Cancer Society for the assistance which it has given us in the development of many of our support programs.

Out-Patient Statistics, 1984

New Patients	197
Follow-up	1,943
	2,140

Procedures:	
Physician	305
Nursing:	
Chemotherapy	1,202
Others	2,963
	4,165

EDUCATION

The Section is fully approved for sub-specialty training by the Royal College of Physicians and Surgeons of Canada, and as a Section of the Department of Pediatrics, University of Manitoba, the teaching and educational programs of the Foundation for medical personnel include:

(a) Training of career pediatric oncologists/hematologists in order to permit them to pick up academic positions and assume careers of clinical practice, teaching and research. All candidates must conform to university entrance requirements for post graduate medical trainees and must have completed their core general pediatric training.

(b) The exposure of other oncology trainees (internal medicine, surgery) to the pediatric oncology patient.

(c) The provision for general pediatric residents of sufficient and appropriate exposure to modern oncology.

The Pediatric Section also participates in a formal elective program for students from the University of Manitoba School of Nursing.

The participation of the nurse, social worker, teachers, play co-ordinator and parents in education of their colleagues, the patients and their families has been discussed previously.

RESEARCH

The Section actively supports clinical investigation aimed at current clinical problems in pediatric hematology/oncology and in the development of long term basic research. Just over $300,000 in grant money was received by the various Section members in 1984.

On-going clinical investigation and basic research in which the Section is participating at the present time:

1. Children's Cancer Study Group: Affiliated member since 1978. All new patients are registered with CCSG and approximately 85% of patients are on study protocols. A. J. Bishop, N. Kobrinsky, M. Schroeder.
2. Research, education and patient care within a Hemophilia Agency. N. Kobrinsky. (Manitoba Chapter of the Canadian Hemophilia society, $16,000).
3. Role of Endothelial Cells on Megakaryopoiesis. N. Kobrinsky. (Medical Research Council of Canada, $64,000).
4. Antenatal treatment of Erythroblastosis Fetalis by maternal administration of high dose intravenous gamma-globulin. N. Kobrinsky, J. Bowman, A. J. Bishop. (Children's Hospital Research Foundation, $16,700, Manitoba Medical Services Foundation Inc., $35,000).
5. The role of DDAVP in dysfunctional platelet syndromes, Von Willebrand's disease and other bleeding disorders. N. Kobrinsky, J. Gerrard, E. Israels, A. Bishop.
6. The development and evaluation of school re-entry programs for children with cancer. Joyce Wright.
7. HLA and disease. M. Schroeder.
8. The balance of thromboxane and prostacyclin in cardiovascular disease. J. Gerrard. (Canadian Heart Foundation, $30,000).

9. Various studies regarding platelet biology and platelet functional disorders. J. Gerrard. (Children's Hospital Research Foundation, $23,000; Manitoba Medical Services Foundation, $33,345; Medical Research Council of Canada, $57,180; National Cancer Institute, $30,345).

These research areas are further discussed and expanded in the report of the Institute of Cell Biology.

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Bishop, A. J.: Psychosocial Aspects of Pediatric Oncology. Symposium on Pediatric Tumors. Canadian Cancer Society, Toronto, November, 1984.

Gerrard, J. M.: Stimulation activation coupling in platelets. International Heart Research Association, Oklahoma City, Sept., 1984.

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Leslie, W.: Role of Play Therapy in Pediatric Cancer Programs. Symposium on Pediatric Tumors, Canadian Cancer Society, Toronto, Nov., 1984.

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Gerrard, J. M. and Friesen, L.: Platelets. In (L. Poller, Ed.) Advances in Blood Coagulation.

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GYNECOLOGIC ONCOLOGY

SECTION HEAD:

Garry V. Krepart, M.D., B.Sc.(Med.), F.R.C.S.(C), F.A.C.O.G.

SECTION MEMBER:

Robert J. Lotocki, M.D., B.Sc. F.R.C.S.(C)

CLINICAL FELLOWS:

Dr. John F. Jeffrey, M.D., F.R.C.S.(C)
Dr. Jill Nation, M.D., B.Sc.(Med.), F.R.C.S.(C)

RESIDENTS:

Dr. H. Arab, M.D., Dr. G. Pohoretsky, M.D., Dr. M. Helewa, M.D.,
Dr. H. Streeter, M.D., Dr. D. Dubyna, M.D.

NURSING STAFF:

I. Chrunyk, B. Lucko

NURSING AIDES:

I. DeSousa, L. Jonasson, G. Harvey

SECTION OF GYNECOLOGIC ONCOLOGY

ORGANIZATION

The Section of Gynecologic Oncology is represented at the Manitoba Cancer Treatment & Research Foundation as well as at the St. Boniface Oncology Unit at the Health Sciences Centre and St. Boniface General Hospital. Members belong to the Section of Gynecologic Oncology of the Department of Obstetrics, Gynecology & Reproductive Sciences of the Faculty of Medicine.

Clinics are held four one-half days weekly at the Manitoba Cancer Treatment & Research Foundation and three one-half days at the St. Boniface Oncology Unit. Close liaison is maintained with the Radiotherapy and Medical Oncology Divisions as well as urologic and surgical oncologists at both institutions. Referred patients are seen at both Oncology units and appropriate consultations, if needed, are made with other divisions. Hospital admissions are at the Women's Hospital or at St. Boniface Hospital. An Oncology Unit as well as a high-dependency area and a dedicated in-patient chemotherapy nurse is available at the Women's Hospital with similar facilities at St. Boniface Hospital on the Gynecology Service.

TEACHING

Various levels of teaching are offered by the Gynecologic Oncology Service. A two-year postgraduate Fellowship Program was established in 1981. Currently the Program has two Fellows, one in each year of fellowship, with new Fellows already accepted for 1985-87. Dr. John Jeffrey will finish in July this year and has accepted a position in the Section of

Gynecologic Oncology, Department of Obstetrics & Gynecology at Dalhousie University. Dr. Jill Nation will finish in 1986 and will join the Section of Gynecologic Oncology at the University of Calgary.

Residents in their third year rotate through the Section for three months rotations as part of their training in the Department of Obstetrics, Gynecology & Reproductive Sciences. Tumor Conferences are held weekly at the Women's Hospital and St. Boniface Hospital with much appreciated pathology backup by Dr. M. Paraskevas and by Dr. G. Vadas. Reviews of current subjects in Gynecologic Oncology or pertinent clinical cases are presented for all residents, medical students, interns and staff.

The Section is responsible for chemotherapy as well as surgery. Bowel as well as urinary complications as they relate to gynecologic malignancy or its treatment complications are handled at both teaching hospitals. Full support is available from all subspeciality areas, including T.P.N., infectious disease, surgery, urology and physiotherapy. Full access to medical workers, chaplaincy service, pharmacy, occupational therapy and dietetics is available and a weekly nursing conference with all support staff represented is held. In excess of 1,000 in-patients were admitted in 1983 at both the Women's Hospital and St. Boniface Hospital units.

CLINICAL INVESTIGATION

The Section is active in the N.C.I.C. Ovarian Cancer Protocols, both at the level of the writing committee and patient treatment. Thirty-four patients have been registered in the advanced ovarian protocols in the last two years.

Other interests of the Section include:

a) Surgical staging of endometrial carcinoma with an eight year review of the Manitoba Cancer Treatment & Research Foundation's experience.

b) Place of second look laparotomy in cancer of the ovary.

c) Chemotherapy treatment of ovarian sarcomas.

d) Frequency of cervical cytology.

e) Colposcopy in preinvasive cervical lesions and the use of laser in cervical, vaginal and vulvar preinvasive disease.

f) The role of staging laparotomy in early ovarian cancer.

g) The role of chemotherapy in ovarian carcinoma of low malignant potential.

SECTION OF SYNECOLOGIC ONCOLOGY STATISTICS

Manitoba Cancer Treatment & Research Foundation and St. Boniface Oncology Clinic

	New Patients	Follow-up Visits	Total Patient Visits	Number of Treatment Courses
1983	314	3,741	4,055	688
1984	379	3,810	4,189	749

Colposcopy (St. Boniface)

	New Patients	Follow-up Visits	Total Patient Visits
1983	189	378	586
1984	275	808	1,083

Hospital Admissions — 1983

	Health Sciences Centre	St. Boniface General Hospital	Total
Surgical	303	52	355
Non-surgical	511	141	652
Total	**814**	**193**	**1,007**

PUBLICATIONS

Results of Prior Cytology Screening in Patients with Diagnosed Stage I Carcinoma of the Cervix. Benoit, A. G., Krepart, G. V., Lotocki, R. J., Am. J. Ob. Gyn. 48:690, 1984.

A Cytolotic History of 245 Patients Developing Invasive Cervical Carcinoma. Carmichael, J. A., Jeffrey, J. F., Steele, H. D., Ohlk, I. D., Am. J. Ob. Gyn. 148:685-690, 1984.

Can We Cure Mixed Mullerian Tumors? Lotocki, R. J., Contemp. Ob. Gyn., March, 1984, p. 155.

Chemotherapy During Pregnancy (book chapter), G. V. Krepart (in press).

Papillary Serous Adenocarcinoma of the Endometrium: A Review of 15 Cases. Jeffrey, J. F., Krepart, G. V., Lotocki, r. J., Ob. Gyn. (in press).

PRESENTATIONS

"Preinvasive Carcinoma of the Cervix" & "Second Look Laparotomy in Carcinoma of the Ovary", University of Western Ontario, London, Ontario, January, 1984, G. V. Krepart.

"Pre or Post-op Radiotherapy in Endometrial Carcinoma" & "Second Look Laparotomy", Update in Gynecologic Oncology, Calgary, Alberta, April, 1984, G. V. Krepart.

"Cervical Dysplasia", Nursing Association of the American College of Obstetricians & Gynecologists, Winnipeg, Manitoba, April, 1984, G. V. Krepart.

"Papillary Serous Adenocarcinoma of the Endometrium — A Review of 17 Cases", Society of Obstetricians & Gynecologists of Canada, Montreal, P.Q., June, 1984, R. J. Lotocki, G. V. Krepart, J. F. Jeffrey.

"Major Complications of Radiation in Treatment of Cervical Carcinoma", Society of Obstetricians & Gynecologists of Canada, Montreal, P.Q., June, 1984, R. J. Lotocki, G. V. Krepart, J. F. Jeffrey.

"Second Look Laparotomy — A Review of 118 Cases", Society of Obstetricians of Canada, Montreal, P.Q., June, 1984, G. V. Krepart.

"Rational Approach to Endometrial Carcinoma", Dalhousie University, Halifax, Nova Scotia, November, 1984, G. V. Krepart.

"Abnormal Cervical Cytology", Nursing Association of the American College of Obstetricians & Gynecologists, Winnipeg, Manitoba, November, 1984, G. V. Krepart.

ONCOLOGY UNIT
St. Boniface General Hospital

Oncology Services Director — Dr. B. H. Weinerman, M.D., F.R.C.P.(C)

Coordinator of Nursing — B. Glenday, R.N., A. Meekison, R.N.
(Sept. 1984 — present)

RADIATION ONCOLOGY

Senior Radiotherapist — James E. Bennett, M.B.ChB., D.M.R.T.
Radiation Technologists — R. Olson, R.N., R.T.T., (Supervisor)
S. Sharpe, R.T. (R); B. Dodds, R.N., R.T.T.; S. Bunio, R.N., R.T.T.
Clinic Nurse — B. Lucko, R.N.

MEDICAL ONCOLOGY

Director — B. H. Weinerman, M.D., F.R.C.P.(C)
H. Schipper, B.A., B.Sc., M.D., F.R.C.P.(C)
E. J. Bow, M.D., MSc., D.BACT, F.R.C.P.(C)
A. M. Shojania, M.D., F.R.C.P.(C)
J. Foerster, B.Sc.(Med.), M.D., F.R.C.P.(C)

Nursing Staff — B. Scott, R.N. — Assistant Nursing Coordinator,
D. Self, R.N., I. Lemoine, R.N.

Nurse-Practitioner — E. Bebchuk, R.N.

Secretarial Staff — P. Rubel, D. Firth, B. Scott.

Support Staff — C. Berthelette, Senior Ward Clerk
R. Provitina, Ward Clerk
H. Lucy, Orderly
E. Denewith, Nurse's Aid

Protocols — E. Stiles, Protocol Data Manager

OUTREACH

Director — H. Schipper, B.A., B.Sc., M.D., F.R.C.P.(C)
Coordinator — V. Mann, R.N., B.A.
Secretary — D. Firth

PHARMACY

D. Dickoff, B.Sc. Pharm.

ONCOLOGY UNIT — ST. BONIFACE GENERAL HOSPITAL

The St. Boniface Hospital Oncology Unit is a fully integrated joint program of the Manitoba Cancer Treatment and Research Foundation and the St. Boniface General Hospital. The original unit, a radiation oncology program, rented an area in the St. Boniface General Hospital and under the guidance of senior radiotherapist Dr. James Bennett, provided radiation therapy services to referred patients for thirty years. Nineteen eighty four marked the retirement of Dr. James Bennett. He will be missed by all.

In 1973, with the introduction of a formal chemotherapy program at the hospital, and with the subsequent growth of that program, a different cooperative effort between the St. Boniface Hospital and the Foundation began to evolve. This arose because of the increased demands for chemotherapy in the population due to the success of this modality of treatment, and the need for inpatient treatment because of the nature of the patient population. In 1975, a joint program established an outpatient oncology clinic in the ambulatory care facility of the hospital.

A New Outpatient Facility

The eventual need for expanded outpatient facilities brought on by the enlarging patient population and the requirement for a new cobalt unit resulted in the planning of a new outpatient oncology facility which had its sod turning ceremony in July of 1982. The new facility had its official opening April 1984. The new six million dollar wing of St. Boniface General Hospital became the site of a modern cancer diagnostic and treatment centre. The three-storey annex is adjacent to the x-ray department and thereby places the cancer diagnostic and treatment facility adjacent to radiological and ultrasound facilities. This facility increases the efficiency of the two oncology areas by physically joining them and thereby better utilizing nursing and other support personnel. A joint nursing coordinator, Mrs. B. Glenday, was appointed in 1984 as supervisor of all nursing positions. Mrs. A. Meekison was subsequently appointed September 1984 when Mrs. Glenday became Director of Nursing for the Foundation. This position serves to cement the entire oncology area and also add a link to the inpatient oncology unit. This latter unit (6 beds), was opened in September 1984 as a forerunner to an expanded unit which will subsequently support intensively treated patients. In addition, the new facility incorporates gynecological oncology and eventually a surgical clinic. The new unit emphasizes a pleasant atmosphere for patients with pleasant working conditions and increased efficiency.

Teaching

The oncology program is fully integrated with the University in the instruction of undergraduate students, interns and residents. As well as individual instruction, residents and fellows take part in the consultation and outpatient rotations. Twice weekly walk rounds with all the medical oncology staff serves as an ongoing audit on patient care, as well as an ongoing discussion of all interesting and difficult hospital patients. Dr. M. Shojania, Director of the Haematology Laboratory at St. Boniface Hospital takes a full participatory role in all teaching and round programs. Drs. I. Carr, and L. Lu of the Department of Pathology, participate in one of the weekly rounds. These rounds are held in the library with a review of slides on selected inpatients currently under treatment.

Research

Biochemical modulation of 5-Fluorouracil with methotrexate in patients with metastatic colorectal cancer (presented at the National Cancer Institute, U.S. January 1984).

A trial of systemic chemotherapy with 5 FU and Methotrexate in mice bearing dimethylhydrazine induced colon cancer.

New investigational drug trials.

Colon cancer research group — (pathology and treatment of colon cancer).

Acute leukaemia research group for the formalization of a treatment protocol for acute leukaemia.

Central venous catheter placement study (a cuffed tunnelled indwelling central venous catheter) for immunocompromized patients.

Herpes simplex oesophagitis in immunocompromized patients.

Evaluating various antibiotics in specific disease categories, infection surveillance program and vaccination programs.

Electronic diaphanography

Quality of life studies in cancer patients.

Further development of the Outreach Program.

OUTREACH PROGRAM

This program is operated by the Cancer Foundation from the St. Boniface Hospital. It is designed to develop safe methodologies for effective chemotherapy administration in rural areas of the province. Specific areas of research development include information handling and transmission techniques for computerized record maintenance from a central facility to the outreach centres. The program has already developed and validated a quality of life index and compared the treatment of breast cancer in the urban and rural populations.

ONCOLOGY NURSING

In cooperation with the University of Manitoba the unit trained a nurse oncology assistant in 1982.

SOCIAL WORK

Patient Care

The Department of Social Work was very pleased this year to receive official approval for a 1.0 full-time social worker for the new oncology outpatient facility. This allowed the implementation of new clinical, educational and research programs. Between April and December about 685 hours of social work service went to and on behalf of patients. This has resulted in a caseload of about 65 cases per month.

In addition to the services provided to and on behalf of patients, the department, in collaboration with the CanSurmount Coordinator, continued the popular monthly patient and family meetings. Topics covered this year included coping, diet, relaxation therapy, Home Care, energy conservation, and how family members cope. Interdisciplinary psychosocial rounds in the oncology clinic, originally organized by Social Work, also continued during 1982.

A pilot project using relaxation therapy to help reduce chemotherapy-related nausea and vomiting continued during 1984. The overall success of the program has led to the development of a research proposal to be submitted in 1985.

In addition, the oncology social worker initiated the development and design of a patient handbook for newly diagnosed cancer patients and their families. It is anticipated the handbook will be completed and distributed during 1985. Finally, the oncology social worker regularly participated in ongoing training sessions for the Canadian Cancer Society CanSurmount Volunteers.

Education and Research

There were programs for social work staff on unorthodox cancer treatments and information sharing, as well as staff participation in the outreach program's chemotherapy administration workshops. and these involved authoring a volume entitled "The Psychosocial Impact of Chemotherapy", to accompany the chemotherapy drug administration package.

During the past year, Social Work has been instrumental in organizing a Manitoba Social Work Oncology Group for oncology social workers in Winnipeg. This group is a forum for social work collaboration in oncology education and research. Finally, this year saw the completion of the Chemotherapy Side Effects Study being conducted in collaboration with the Psychosocial Committee of the Eastern Cooperative Oncology Group (ECOG) in which we participated as a member of the Steering Committee.

TABLE I — Medical Oncology Statistics, St. Boniface General Hospital

	New Patients	Follow-up visits	Total Physician Visits	No. of Patient Treatments	Procedures
1981	224	2,242	2,466	2,326	N.R.
1982	306	2,580	2,886	2,152	N.R.
1983	377	4,257	4,694	3,753	3,399
1984	395	4,141	4,536	2,699	4,984

TABLE II — Protocol Statistics, St. Boniface General Hospital — 1984

GROUP	On Study in 1983	New Patients Entered during 1984	Off Study during 1984	Patients on Active follow-up (End 1984)
NCIC	59	16	12	63
NSABP	89	16	7	98
Local and Others	24	12	11	25
TOTAL	**172**	**44**	**30**	**186**

PUBLICATIONS

Bow, E. J., Louie, T. J., Riben, P., McNaughton, R. D., Harding, G. K. M., Ronald, A. R.: Randomized Controlled Trial Comparing Trimethoprim/Sulfamethoxazole Prophylaxis in Hospitalized Granulocytopaenic Patients. Am. J. Med. **76**:223-233, 1984.

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Conly, J. M., Ramotar, K., Chubb, H., Bow, E. J., Louie, T. J.: Hypoprothrombinemia in Febrile, Neutropenic Patients with Cancer: Association with Antimicrobial Suppression of Intestinal Microflora. J. Infect. Dis. **150**:202-212, 1984.

H. Schipper, MD, J. Clinch, MA, A. McMurray, RN, BA, M. Levitt, MD. Measuring the Quality of Life of Cancer Patients: The Functional Living Index — Cancer (FLIC) Development and Validation. Jour. of Clin. Onc., **2**:472, 1984.

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ABSTRACTS

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MEDICAL PHYSICS

DIRECTOR — S. Shalev, Ph.D.

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T. Lee, Ph.D., R. Palser, Ph.D., A. Sourkes, Ph.D.

CLINICAL PHYSICS

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M. Stewart, R.T.T., A.C.(T), M. Stuart, R.T.T., A.C.(T)
K. Suderman, R.T.(T), M. Tokar, R.T.(T),
O. Werner, B.Sc., R.T.(NM), C. Zeller, R.T.(T).

MEDICAL DEVICES

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A. Wolk

MEDICAL TECHNOLOGY

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B. Kettner, B.Sc., J. Legris, B.Sc.

NUCLEAR ELECTRONICS

M. Goldie, C.E.T., M. Hanuschuk, R. Shabaga,
W. Stepaniuk, Y-L Sun

RADIATION PROTECTION

R. Kowaluk, R.T.(R), C. Neduzak, R.T.(R),
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J. Linford, Ph.D., P. Wylie

FELLOWS

M. Al-Ghazi, Ph.D., C-W Cheng, Ph.D.

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SUMMER STUDENTS

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J. McLellan, B.Sc., W. Poluha, B.Sc., B. Simons

SECRETARIES

L. Beauchamp, T. Davidson, S. Hogue, C. Ranick

This year saw significant progress in all areas of our work. Clinical support in Nuclear Medicine, Diagnostic Radiology and Radiation Therapy was strengthened, new procedures were introduced, and the range of our activities broadened. The academic program was enhanced by the introduction of a full graduate option in Medical Physics, as well as an increase in the number of students carrying out research in the department. Several new research projects were funded at the provincial and national levels, and with the increase in staff space is now at a premium. This is an active department, consolidating past practice and expanding into new endeavors, while striving to maintain a high standard of excellence in all our activities.

RADIOTHERAPY PHYSICS

G. Froese

Clinical physics support for radiotherapy has been provided in the areas of quality control for therapy machines and simulators, dosimetry, brachytherapy, treatment planning and teaching.

The quality control program has been improved by using more measuring aids and extending the number of tests performed. This is particularly the case for the simulators where the program now includes the film processor and image intensifier performance. In the area of dosimetry the output of the machines has been recalibrated according to a new protocol (TG21) which has been proposed by the American Association of Physicists in Medicine. Dose distributions have been measured in anthropomorphic phantoms for unusual cases and stray radiation. Doses received by patients to sensitive areas have been checked with thermoluminescent dosimetry.

The major development during the past year has been the commissioning of the Theratron 780 cobalt unit at St. Boniface General Hospital. This involved acceptance testing, licencing, integrating the machine into the quality control program, and training the technologists in its operation. Extensive measurements, such as output for different field sizes, depth doses and beam profiles were carried out and these data were entered into the AECL Theraplan computer system.

In brachytherapy this section has continued to be the custodian of the sealed radioactive sources for the gynecological afterloading system with cesium 137 and the interstitial after loading and mould systems with iridium 192. A quality control program has been in operation, as required for compliance with the licence and the safe operation of the systems. Service has been provided to radiotherapy in assisting with the planning of implants, ordering, servicing and preparation of the sources and with the dosimetry of the implants. The radiation protection of areas around the rooms occupied by brachytherapy patients at the H.S.C. and radiation protection for the attending nurses was reviewed. Specifications for a special bed incorporating appropriate radiation shielding were worked out, and the construction of one bed has now been completed by the section of Medical Devices.

In Treatment Planning the AECL Theraplan computer system has now been operational over one year. A continued effort is being made to fit electron beam data for a wider range of electron energies. The use of CT for treatment planning with the Theraplan system has been further investigated. Such problems as relating the position of the patient in the CT slice to the position for treatment planning are not yet fully solved. There has been an increased use of portal films for treatment field verification. The section has assisted with the development of new planning procedures and with checking of individual patient plans, as well as participation in treatment planning meetings with the Radiation Oncologists.

There has been a continued and expanding support for the teaching program of radiotherapy technologists. Members of this section have also served on committees investigating the future need for radiotherapy and simulation equipment and formulating a proposed plan for future equipment acquisitions.

TREATMENT PLANNING

M. Stewart

The treatment planning and simulator section if responsible for providing technical support for the individualized design and implementaton of treatment plans for the treatment of cancer with radiotherapy.

The simulator is an x-ray machine used for the localization of tumor volumes and marking of treatment fields on patients. During the year, the AECL Therasim was used full-time while the Picker simulator was used half-time. The total number of patients simulated was 2,872 which represents an increase of 16% over 1983.

In addition, staff from this section provided "marker" films at St. Boniface General Hospital for 90 radiotherapy patients from September to December. "Marker" films are taken on patients who are not sent to the Manitoba Cancer Foundation simulator but who need an x-ray film to confirm the treatment area.

The number of patients in treatment planning increased by 27%. The procedures in this area include the design of cerrobend shielding both with standard shields and individualized shields for field shaping — an increase of 16%; the design of treatment field arrangements and specific dose calculations — an increase of 35%. Frequency of TLD measurements remained at approximately the same level. Port films which are taken on the treatment machines to verify the accuracy of patient positioning have increased by 64%.

Preliminary work has been done on the computer for planning with CT scans. It is expected that in the coming year a large number of patients will be planned using CT data.

This Section continues to have a substantial commitment to the education of radiotherapy technologists both in didactic lectures and in practical training.

NUCLEAR IMAGING

R. Palser

The Section of Nuclear Imaging provides a clinical service to the Manitoba Nuclear Medicine departments in the areas of procurement and acceptance testing of equipment, its optimal use and ongoing quality control, developmental research, radiation protection and teaching.

In the area of equipment purchase, the tender evaluation process, developed and modified somewhat over the past two years, has proved particularly useful in ensuring that major equipment installations operate optimally and in resolving equipment performance problems with the supplier.

During the year an x-ray computed tomography scanner was accepted at St. Boniface General Hospital after some initial x-ray beam quality problems were resolved. Also at St. Boniface General Hospital an image intensifier system was installed and accepted in the Radiology Department, and a two terminal computer system was installed in the Nuclear Medicine Department. This system replaced an aging small computer, and has greatly enhanced the cardiac and general imaging capability of the department.

A gamma camera has been installed and accepted at Victoria General Hospital, and the small computer removed from St. Boniface General Hospital interfaced to it to provide a cardiac capability adequate for the present workload.

At the Health Sciences Centre a single photon emission computed tomography gamma camera (SPECT) system has been installed. This machine consists of a computer controlled rotating gamma camera and produces transaxial cross-sectional images of the distribution of a radiopharmaceutical administered to the patient. The specific machine was selected after tender evaluation, site visits and comparison of phantom studies performed during the site visits. The equipment was installed late in the year and acceptance testing, started in December, revealed a number of operational problems that had not been resolved by the year's end.

A large number of smaller projects related to equipment evaluation and acquisition were completed during the year. At St. Boniface General Hospital dose calibrator, film processor, radiation shielding, radioactive calibration source and uptake monitoring evaluations were made. At the Health Sciences Centre the radiation monitoring requirements of both the Radiopharmacy and the Nuclear Medicine Section were reviewed and evaluated, and the performance of an older gamma camera measured to assess the desirability of its replacement or upgrade. In preparation for the opening of a new Department of Nuclear Medicine at the Seven Oaks General Hospital, the general equipment requirements were reviewed and specific recommendations made with respect to radiation monitoring equipment. In the new year recommendations regarding a gamma camera and computer system will be made.

A number of clinical protocols have been reviewed and modifications introduced. The blood volume measurement protocols used at two city hospitals have been modified to make better use of available equipment. A project to determine the cause of differing quality clinical images between two gamma cameras of similar performance specification has been satisfactorily completed after starting the previous year. Another project examined the St. Boniface General Hospital CT Scanner operating parameters in order to minimize the generation of bone artifacts in clinical head scans. The renal analysis program, under development last year is nearing clinical utility.

At the Health Sciences Centre preliminary work on the development and optimization of clinical protocols for the new SPECT system was started and will continue next year.

The nuclear medicine quality control program covers all clinically used gamma cameras in the city hospitals and has now been expanded to cover the uptake probes, and some of the film processors, well counters and monitoring equipment used in the Nuclear Medicine departments. The program regularly reviews the performance of each item of equipment with a view to maintaining long term optimal and stable operating characteristics.

In the area of radiation protection, the restructuring of the joint Health Sciences Centre, University of Manitoba program is now complete and operating satisfactorily.

The Section members have been heavily involved in teaching during the year. Two graduate courses were given in the Medical Physics Option Program offered via the University of Manitoba Physics Department, and several seminars and lectures were presented to the radiology residents and staff of the nuclear medicine departments.

NUCLEAR ELECTRONICS

W. Stepaniuk

The Nuclear Electronics Section with a staff of 5 technologists continues to provide a comprehensive repair service and preventative maintenance on all major items of equipment in the departments of radiotherapy at the Manitoba Cancer Foundation and St. Boniface General Hospital, as well as the Nuclear Medicine departments at Health Sciences Centre, St. Boniface, Grace, Victoria and Misericordia Hospitals and also to the Nuclear Medicine Teaching Department at Red River Community College.

During the past year several major equipment purchases were made in the Radiotherapy and Nuclear Medicine Department. In preparation to maintain this new equipment once the warranty expires, three of our technologists attended one and two week factory training courses. These included an MDS Spectra A^3/A^2 Nuclear Medicine Computer, an Elscint SPECT Gamma Camera and Computer course and an AECL Theratron 780 Cobalt 60 course.

Performance of Radiotherapy and Nuclear Medicine Equipment in 1984

(1) The 29 year old Picker Cobalt 60 at St. Boniface was finally removed from service. The new replacement, an AECL Theratron 780 Cobalt 60 was installed in the treatment centre in a new building at St. Boniface Hospital.

(2) The Siemens 250KV x-ray unit has a new x-ray rube installed and the cathode cable replaced. Although now at an advanced age, this unit still continues to provide good service.

(3) The AECL Theratron F Cobalt 60 provided good dependable service, with only minor service problems.

(4) The 4 MV Linear Accelerator provided good service with only one 3 day treatment interruption, when a RF circulator had to be replaced.

(5) In spite of greatly increased clinical use, the Sagittaire Linear Accelerator continues to give good service with only minor problems which did not seriously interfere with therapy treatments.

(6) The Picker and AECL simulators provided good service with only minor interruptions.

(7) In the past year the equipment in the Nuclear Medicine Departments experienced no major breakdowns. Major equipment purchases and relocation of some were at the following centres:

(a) A new Picker large field of view gamma camera was installed at Victoria Hospital. The old Ohio Nuclear Camera was moved to the Nuclear Electronics Section M.C.F., to be used as a training unit.

(b) A MDS Spectra A^3/A^2 Nuclear Medicine Computer was installed at St. Boniface. The old ADAC Computer was moved to Victoria Hospital and interfaced to the new Picker Gamma Camera.

(c) With the removal of an old GE Rectilinear Scanner from H.S.C. Nuclear Medicine, room was made available to house a new Elscint SPECT Gamma Camera and Computer. Installation of this unit is to begin in December.

(d) The old INO/TECH ULTIMA/2 M.C.A. analyser and computer in Radiopharmacy due to its age and obsolescence, was replaced with a new Canberra M.C.A. and an RCOMP Super 400 Computer.

MEDICAL DEVICES

J. Legal

During 1984 we have been able to improve our services by clearing up much of the backlog of work that has been pending for a long time. In part this was due to an additional person in Medical Devices. We are pleased to welcome Terry Gaboury who we are certain will be a real asset to our operation. In 1984 few jobs were turned down and we even had time to undertake a number of developmental jobs as follows:

The technetium generator number 4 model II is now complete and in service. We are in the process of overhauling three older units, one of which was built here 10 years ago. It is expected that once overhauled they will be as good as new and remain in service for many years to come.

A skin sparing couch top was designed and built for the cobalt model F teletherapy unit. This new couch incorporates a number of removable panels which allow a range of adjustable openings. These openings can be left blank or replaced with one of two tennis raquet type panels, the purpose being to allow treatment of patients from below the couch while minimizing the skin burning effect.

The project that received the most publicity and acclaim (even though it has yet to be put into service) has been dubbed "The Lead Bed". As the name implies this is a bed that incorporates a lot of lead (over 600 kg). It has been designed to shield patients and staff in adjacent rooms and the floor below from brachytherapy patients, who must remain in bed for up to 48 hours with radioactive sources applied. Attending staff are protected by a movable lead shield which rides on rails built into the bed. A second identical unit is under construction and it is anticipated that both will be installed on B6.

A ventilatory muscle endurance apparatus was constructed. A known load can be applied to the inhalation cycle of a patient breathing through this device, making it possible to precisely measure muscle endurance.

Beam alignment test jig. This is designed to improve the efficiency and accuracy of measurements for the quality control of all teletherapy units and simulators.

Blood pressure transducer positioner. Designed to improve and streamline heart catheter procedures in the operating room.

Breast biopsy markers. Made from stainless steel wire, these markers help to surgically locate tumors from radiographs obtained through the breast screening program.

Peritoneal dialysis aids. To simplify home use of related equipment by disabled patients.

Respiratory inhaler aid. To facilitate use of commercial inhalers by weak or arthritic patients.

Ongoing research within medical physics such as the transillumination, hyperthermia, and digital angiography subtraction projects continue to require specialized apparatus.

Three dimensional projector. A start was made on this challenging project which will ultimately be used to determine stereotactic coordinates for neurosurgical procedures.

For the Wescan Conference the Section of Medical Devices prepared a poster display on brachytherapy instruments and presented a talk on mould room techniques.

Five students each spent two weeks in our mould room and several physicians spent a lesser period learning the fundamentals of mould fabrication.

The patient load in the mould room remained almost identical with last year, 480 new patients were seen and repeats accounted for 813 patient visits.

Sealed source deliveries also remained about the same as in 1983. They were as follows: Cesium deliveries 222, beta plaque 46, and iridium 18. However, there appears to be a greater demand than ever for more specialized devices. Listed below are custom devices fabricated in the mould room in 1984.

- Clear vinyl oxygen head boxes for respiratory patients.
- Organ isolation vessels for pharmaceutical research at the University of Manitoba.
- Patient positioning shells for the background subtraction angriography project.
- A "space helmet" for respiratory research at the University of Manitoba.
- Iridium applicators for lips and ears.
- Practice model and guide system for iridium implants of a breast.
- Developmental work on a new technique for teletherapy of breasts.

RADIATION PROTECTION

A. M. Sourkes

In 1984 the Radiation Protection Section (RPS) of the Manitoba Cancer Foundation continued administration of X-Ray Safety Regulation 207/79 under the Public Health Act as well as carrying out an inspection program in the area of non-ionizing radiation safety for the Department of Environment and Workplace Safety and Health, and the Department of Health. Under the X-Ray Safety Regulation, the major effort of the RPS was in surveying of the x-ray units throughout the province. The RPS continued to act as the intermediary for the TLD (thermoluminescent dosimeter) plaque radiation monitoring service in use by the 4500 x-ray workers in the province. This responsibility includes checking for proper usage of the service by the 550 groups involved, registering and deregistering groups as required, investigating undue exposures and compiling an annual summary of all exposures.

In the area of non-ionizing radiation, protection surveys were performed in industrial facilities, health institutions, and educational institutions including Universities, Technical Vocational Schools and Community Colleges. A total of 622 devices in the province were surveyed for possible hazardous emissions of non-ionizing radiation. Device types surveyed included radiofrequency glue dryers and heat sealers, induction heaters, short-wave and micro-wave diathermy units; ultraviolet curing machines, silk screening lamps, sun tan booths, (psoralin) PUVA cabinets, actinic dermatology lamps, ultrasound therapy units, ultrasound sewing machines, research lasers, medical lasers, alignment lasers, demonstration lasers and laser light shows. In addition to the survey work performed, an information packet was sent to concerned individuals and groups in response to enquiries regarding possible radiation emissions from video display terminals.

Other activities included the provision of consulting services to the Department of Environment and Workplace Safety and Health, response to public inquiries on ionizing and non-ionizing radiation matters, the delivery of radiation safety lectures on request, emergency response to incidents involving the use or transport of radioisotopes, the performance of wipe test analyses for isotope licensees and the design, inspection and approval of new x-ray facility barrier installations. The environmental radiation monitoring program of ground and surface waters in the vicinity of the Underground Research Laboratory in southeastern Manitoba continued with the monitoring accommodating additional sampling requests by area residents. The advisory committee on radioactivity in drinking water was expanded to include consideration of the presence of radon in dwellings. As well, participation in the national technical committee dealing with the management of low level radioactive waste continued in 1984.

RADIATION PROTECTION ACTIVITIES

Activity	Number
Protective Barrier Room Design Approvals	64
Protective Barrier Installation Inspections	28
Dosimetry Exposure Investigations	19
Wipe Sample Analysis	284
Response to Public Inquiries	209
Radiation Safety Lectures	22
Mail-In Dental Unit Checks	573
Non-Ionizing Device Surveys (see summary below)	622
X-Ray Machine Inspection	507
Miscellaneous Surveys	25

SUMMARY OF 1984 NON-IONIZING RADIATION SURVEYS

Industrial Radiofrequency and Microwave Devices	66
Industrial Ultrasound Devices	3
Industrial and Commercial Ultraviolet Radiation Devices	197
Lasers and Laser Light Shows	40
Medical Lasers	2
Medical Radiofrequency Devices	28
Medical Ultraviolet Therapy Devices	145
Medical Ultraviolet Radiation Devices	23
Microwave Units	32
Miscellaneous Radiation Emitting Devices	86
Total Non-Ionizing Device Surveys	622
Public Enquiries	143
Consultations	44

SUMMARY OF 1984 X-RAY MACHINE REGISTRATION AND INSPECTION DATA

Type of Installation	Total Registered	In Service	Surveyed in 1984	Approved Initially	Corrected & App. During Survey	Approval Withheld	Approved Subsequently
Chiropractors	35	32	27	20	1	6	5
Dental	765	738	155	118	12	25	24
Educational	53	48	25	19	3	3	3
Hospital	172	168	102	89	0	13	13
Industrial	29	28	9	8	1	0	0
Lab & X-ray	122	121	98	74	0	24	24
Medical Offices	74	73	51	43	1	7	7
Veterinarian	69	69	40	28	1	11	11
Totals	**1,319**	**1,277**	**507**	**399**	**19**	**89**	**87**

MEDICAL PHYSICS SEMINARS

The regular Monday lunch-time seminar series included 29 presentations on a wide variety of topics. Speakers came from the staff of the Cancer Foundation, from the University of Manitoba, and from other centres. The subjects discussed covered many areas of medical physics, biophysics and radiation physics.

MEDICAL PHYSICS GRADUATE PROGRAMME

The Medical Physics Graduate Programme is organized under the auspices of the Physics department in the Faculty of Science at the University of Manitoba. There are currently a total of 5 M.Sc. students and 1 Ph.D. student in the graduate programme. The funding for the students includes one National Cancer Institute Fellowship, one U of M Fellowship, two MCTRF Fellowships and one student partially financed from a research grant from a commercial company.

The graduate programme has involved members of the Medical Physics department obtaining appropriate positions as adjunct professors in the Physics department at the U of M and offering the following new graduate courses.

Course Number	Title	Presenter(s)
16.736	Medical Radiation Physics	Dr. R. F. Palser
16.737	Radiotherapy Physics	Dr. P. Dunscombe
16.738	Radiation Biology	Dr. G. Froese
16.739	Radiation Protection	Dr. W. Huda/Dr. A. M. Sourkes
16.740	Medical Imaging	Dr. S. Shalev/Dr. T. Lee
16.741	Diagnostic Methods	Dr. S. Shalev/Dr. T. Lee

The courses are open to all eligible students at the U of M and have been taken by the M.Sc. and Ph.D. Medical Physics students, graduate students in the Physics department at the U of M and also by occasional students at the U of M.

A Medical Physics Option has also been introduced which enables prospective M.Sc. students to obtain a degree by taking a total of four approved courses and by completing a suitable practicum thesis.

Details of the students in the Medical Physics Graduate Programme are shown below in summary form.

Student	Degree	Research Topics	Academic Supervisor
G. A. Sandison	Ph.D.	Electron Dosimetry	Dr. W. Huda
P. Therrien	M.Sc. (Research)	Radiotherapy Optimization	Dr. S. Shalev
T. Constable	M.Sc. (Research)	Hyperthermia	Dr. P. Dunscombe
A. Tsoukatos	M.Sc. (Research)	Hyperthermia	Dr. P. Dunscombe
E. Papiez	M.Sc. (Research)	Electron Dosimetry	Dr. G. Froese
R. Aroumougame	M.Sc. (Research)	Digital Radiology	Dr. Shalev

EVALUATION OF DIGITAL ENHANCEMENT OF PORT FILMS

C-W. Cheng, S. Shalev

Port films exposed to high energy therapeutic radiation beams have inherently low contrast, and the precise location of anatomical landmarks is often difficult. We are studying the digitization and contrast enhancement of port films, and comparing the results to conventional photographic enhancement methods. The DICOM-8 digital imaging computer is used, together with a vidicon camera for image acquisition and an RGB video monitor for display. Quantitative measurements of treatment field localization errors are made by comparison with the prescribed treatment area marked on the simulator planning film, using real-time subtraction for correct relocation. Digital enhancement techniques include convolution, blurred mask subtraction and histogram equalization, and these have a significant influence on the perception of anatomical structure.

CLINICAL HYPERTHERMIA

P. B. Dunscombe

The effort throughout the year has been directed towards readying the heating and thermometry systems for clinical studies. A 2450 MHz microwave generator with forward and reflected power monitoring and a specially designed, matched, low leakage applicator was acquired in the spring of 1984. Subsequently, extensive phantom studies were undertaken in order to characterize the Specific Absorption Rate distribution produced by this applicator in a tissue equivalent gel. A minimally perturbing thermistor probe was also obtained and subjected to thorough preclinical assessment. Development of the eight channel thermocouple thermometer continued with the final assembly taking place late in the year. Currently, this system, which will greatly enhance the dosimetric information available, is undergoing the final stages of acceptance testing and it is hoped that it will be introduced into clinical use early in 1985.

After approval by the Ethics Committee, the first patient was treated with 2450 MHz microwave radiation and thermistor temperature monitoring in December 1984.

MONOCLONAL ANTIBODIES TO MOUSE TUMOR CELLS

G. Froese

The objective of this investigation is to examine in animal tumor systems (L5178Y lymphoma in DBA/2 mice and S1509a sarcoma in A/J mice) the antibody response to a syngeneic tumor as captured by hybridomas, and examine the usefulness of the antibodies and corresponding antigens for diagnosis and therapy. A clone, D9, was selected from a stock of previously isolated hybridomas. This clone produces a monoclonal antibody against the 1509a sarcoma cells. Further experiments have been carried out to characterize the antibody and the corresponding cell-surface antigen. The antibody was found to be of IgM class. No significant complement mediated lysis of tumor cells could be demonstrated, however, a 2 to 4 day growth delay was observed for tumors if the injected cells had been incubated with antibody. The density of antibody binding sites on the sarcoma cells was found to be relatively low and was estimated to correspond to 7×10^4 IgM antibody molecules per cell. The highest antigen concentration was observed for exponentially growing cells. Stationary cell cultures had a lower antigen density. Antibody bound to the cells at 4°C was rapidly lost from the sarcoma cells on incubation at 37°C (80% in 3 hours). The loss of antibody was associated with only a small transient decrease in antigen concentration, indicating a rapid turnover of antigen on the cells. An immunochemical analysis of the antigen indicated that it is a large molecule of 500,000 daltons or more. An understanding of the functional role played by the antigen during the growth of the sarcoma cells may suggest avenues of intervention with the progressive growth of a tumor.

CT DOSIMETRY

W. Huda and G. A. Sandison

The project was funded by the Manitoba Health Research Council and involved the quantitative evaluation of the somatic and genetic radiation risks associated with the clinical operation of the EMI 5005 CT scanner at the Health Sciences Centre. The analysis of the experimental work has now been completed and the work is in the process of being published in the scientific literature. The scope of the work has been extended to compare the radiation risks associated with CT scans to the radiation risks associated with comparable Nuclear Medicine procedures. Further extensions are currently in progress to perform intercomparisons of the radiation risks in CT scanning with those encountered in conventional diagnostic Radiology.

DEPTH PERCEPTION FOR MULTI-SLICE DATA SETS

B. Kettner, S. Shalev

The volumetric data set represented by multiple CT scans can be displayed on a video monitor as a pseudo 3-D image which gives the viewer the perception of depth and volume relationships. We are investigating how this may be done with optimal clinical effectiveness. The work is based on the DICOM-8, a low-cost stand-alone microprocessor based digital imaging computer with versatile image display facilities. Colour, shading and isometric graphics provide the illusion of depth. Interpolation is used to expand sparse or non-congruent data sets. Physical windows can be opened into the data volume under operator control to permit visualization of internal structure. Selected tissues may be made transparent, and the viewing angle can be altered. The problems inherent in volumetric imaging for radiotherapy treatment planning are being investigated, particularly the simultaneous display of both the 3-D anatomical structure and the predicted 3-D dose distribution. Applications in MRI, PET, SPECT and US imaging are also being evaluated.

APPLICATION OF LINEAR MODELLING TO DYNAMIC RADIONUCLIDE STUDIES

*T. Lee, D. Greenberg**

*Nuclear Medicine, Health Sciences Centre

A research grant has been obtained from the Manitoba Cancer Foundation to investigate this approach to data analysis of dynamic radionuclide studies in the Nuclear Medicine Department, Health Sciences Centre. A preliminary study of patients with renal disease has been completed. The values of extraction efficiency and mean transit time of the kidney obtained corraborate the results of other investigators. In these renal studies the interference of liver activity has been a problem, investigation is currently underway to find a method whereby this source of inaccuracy could be minimized. A theoretical model has been developed for the measurement of the portal fraction of liver blood flow. Clinical studies to verify this model are in progress. A basic problem of the linear modelling approach has been the increased computational time required and investigation of the use of a pipe-lined bit slice processor to speed up the calculations is planned.

RIGHT VENTRICULAR EJECTION FRACTION BY FIRST PASS RADIONUCLIDE ANGIOGRAPHY

T. Lee, J. P. Maclean, A. E. Peterdy**

*Nuclear Medicine, St. Boniface General Hospital

A quantitative and non-invasive method of measurement of right ventricular function would be helpful to clinicians in the management of patients with various types of heart disease including congenital, coronary and pulmonary related. A non-invasive radionuclide technique has been developed using a single crystal gamma camera interfaced to a computer system. In a group of seven 'normal' patients, whose cardiac function is being assessed before chemotherapy, the right ventricular ejection fraction (RVEF) was determined by the method after informed consent was obtained. The RVEF has a range from 47% to 78%, and a mean ± standard deviation of 63 ± 10%. These results compare favorably with those obtained by other investigators using invasive techniques such as x-ray contrast ventriculography. The next stage of the project will be to investigate the reproducibility of the method.

3-DIMENSIONAL IMAGE PROJECTOR

R. Palser

This project, funded by the Health Sciences Centre Research Foundation, is to build a three dimensional image projector. The device will project multiple computed tomographic images of the brain onto a moving screen to form a volumetric or three dimensional image of a "transparent solid".

The project consists of two major sub-systems, a high speed rotating prism image projector and a synchronized moving screen. The development work on both sub-systems has been completed, and the construction of the high speed moving screen assembly is nearing completion.

ELECTRON DOSIMETRY

G. A. Sandison and W. Huda

The project is designed to improve the dosimetry for electron beams in patients undergoing Radiotherapy treatment of cancer. The diagnostic use of CT scanners generates very useful quantitative data pertaining to the physical parameters of patients. This CT generated data includes electron densities, effective atomic numbers, patient contours and can be incorporated into Treatment Planning to improve the accuracy of the dose distributions associated with electron treatment beams. The work is partially supported by a Fellowship from the National Cancer Institute.

The research work has concentrated on developing pencil beam models for use in electron dosimetry. A number of theoretical and semi-empirical approaches to the parameterization of pencil beams have been quantitatively investigated. The utility and accuracy of each approach has been evaluated on the basis of its ability to generate dose distributions for the clinical Sagittaire accelerator in a homogeneous tissue equivalent medium. The specific advantages and limitations of each pencil beam model have been elucidated.

Experimental work has been performed using specially designed dosimetry phantoms to obtain quantitative parameters of the semi-empirical pencil beam model at a range of electron energies on the Sagittaire accelerator used in routine clinical radiotherapy. The work has been extended to investigate the changes in the pencil beam parameters when the irradiated medium undergoes a change in both electron density and effective atomic number. A model of scaling factors that incorporates these physical changes has been developed and is currently undergoing experimental evaluation by utilizing dose distribution data obtained with the Sagittaire using both water and aluminum phantoms.

In addition, a clinical phantom has been designed and built for use in scanning Radiotherapy patients on a CT scanner. The phantom's purpose is to calibrate the CT numbers obtained on the patient scans and to investigate their variation with a range of operational parameters. The phantom is now being used on a routine basis and the data obtained is in the process of being evaluated for its utility in electron Treatment Planning calculations.

DIGITAL FILM SUBTRACTION ANGIOGRAPHY

S. Shalev, C-W. Cheng

We are investigating an inexpensive alternative to fluoroscopic DSA, known as ditial film subtraction angiography (DFSA). Conventional angiographic films are digitized and subtraction is used to register each film relative to the mask, and some correction is possible for patient movement. Frame averaging is used to reduce video system noise. A versatile software library has been written for image manipulation, processing and display. The library includes windowing and thresholding, addition, subtraction and scaling, logical operations such as peak mapping, histogram equalization and look-up table manipulations, and generalized neighborhood convolution filters. DFSA studies are processed using orthographic and isometric projections, pseudo three-dimensional and stereo presentations, peak maps and colour-coded phase diagrams. Spatial resolution is excellent and biplane and stereoscopic techniques are readily performed. Further studies are under way to optimize the film/screen combination, and to determine the clinical utility of DFSA.

THE PHYSICS OF DIAPHANOGRAPHY

S. Shalev, J. Linford, J. Bews, H. Schipper, R. Brown**

*St. Boniface General Hospital

The increasing use of transillumination for detection of breast cancer has prompted us to study the transmission of light through human tissue. Measurements of optical extinction due to absorption and scattering have been made over the range 500-900 nm for a variety of cell suspensions, tissue equivalent media and samples of normal and malignant breast tissue. Imaging studies are performed with the DICOM-8 digital imaging computer. A special phantom has been developed for measuring the MTF of scattering media, using mask mode digital subtraction techniques. Preliminary results indicate that multiple scattering is a major factor in the formation of a diaphanographic image. Claims of other researchers that cancerous tissues exhibit selective absorption bands are not substantiated, and small lesion detection is probably due to increased vascularity and enhanced light absorption by partially deoxygenated haemoglobin in venous blood. This work is expected to lead to an improvement in diaphanographic imaging techniques for the detection of small lesions deep within the breast.

TREATMENT PLANNING BY MINIMIZATION OF REGRET

S. Shalev, P. Therrien, L. Bartel

We are developing and testing under clinical conditions a computer program for the quantification of desirability of alternative treatment plans. This is done in several stages, each involving a more sophisticated analytical approach. The first stage consists of adding coloured regions to the standard treatment plan charts as used at this time. The additional coloured areas indicate regions of regret, where the tumor dose is below a specified required minimal level, or normal tissue is receiving an unacceptably high dose. It is found that comparison of such "images of regret" is a powerful and rapid method of selecting the least undesirable plan, and hence providing a simple form of optimization. The second step involves the quantification of levels of regret, using score functions to define the acceptability of dose gradient across the tumor, tumor coverage, normal tissue irradiation and similar parameters. The third step involves the determination of absolute risk for all perceived complications that may arise from the proposed treatment. For this purpose, sigmoid curves of complication risk versus dose for different tissues are generated from clinical data in the literature, and used on a point-by-point basis over the regions of interest to compute a volume integration of total risk of complications.

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ONCOLOGY SOCIAL WORK

DIRECTOR — B. S. H. Wong., M.S.W., R.S.W.

SOCIAL WORK STAFF

Beatrix Pociwauschek, B.S.W.

SUPPORT STAFF

Karen Yaremchuk

SOCIAL WORK STUDENTS

Nancy Boni, Rob Vincent

The Department of Oncology Social Work was established jointly by the Health Sciences Centre and the Manitoba Cancer Treatment and Research Foundation in 1974. The year under review 1984, therefore marked the department's tenth anniversary.

With the employment of a professional Social Worker in 1974, Social Work Services delivery to patients known to the Foundation were reviewed. While the department continued to provide essential and practical services to cancer patient, its staff was also prepared to deal with the psychosocial problems encountered by patients and/or families during the initial stages of diagnosis and subsequent courses of treatment. Much credit should be given to the first director of the department who took on the most difficult task of establishing the new department which, for many years had been run by non-social work personnel.

While the need for additional professional staff is a perennial problem, the department has managed to function and meet the demands of an increasingly heavy caseload by having professional staff concentrate on counselling and support staff handle practical services. Social Work referrals have increased steadily in number.

Inpatients at the Health Sciences Centre continue to demand a great deal of our staff time. During the year under review, 12 Acute Myelocytic Leukemia and 73 Mastectomy patients and their families were referred for services in addition to our Regular Foundation patients who were admitted to the Health Sciences Centre, and all those who were being followed as outpatients in Foundation clinics.

I. Patient Care

1) *Counselling Services:* Counselling services are provided to cancer patients and their families who have difficulty coping with this disease. Some require brief but intensive counselling at the initial diagnosis stage; others require counselling to sustain their families' equilibrium during the period of remission not knowing if and when relapse will recur; there are others who require counselling in anticipation of eventual death and bereavement for the family. In all cases however, early Social Work intervention is recommended to minimize the need for more intensive services at a later date.

Social Work consults come from many sources. In addition to the regular referrals from staff physicians and nurses, many referrals are made by private physicians, community agencies and self-referrals from patients and their families.

2) *Referral Services:* Because long term treatment procedures frequently interrupt productive employment, many patients do not have sufficient resources to support themselves and their families. Resource counselling is provided to those who are experiencing financial difficulties during their illness. After proper assessment and intervention, referrals are made to the appropriate financial agencies in the community.

Frequent referrals are made to the Home Care Department for services to enable patients to continue to function in the community minimizing inpatient hospital care. Requests for certain practical services are made to the Cancer Society through their office at the Foundation.

On occasion, psychiatric consultation is sought regarding cases that are followed by Oncology Social Work for ongoing counselling.

3) *Discharge and Transfer to Other Institutions:* Discharge planning for inpatients known to us continues to demand a great deal of our time. Many patients and their families find it difficult to accept the reality that they can no longer function in the community and therefore need extended care. Actual transfers to the Princess Elizabeth Hospital and other health care institutions are handled by the Social Works Assistant at the Health Sciences Centre, Department of Social Work.

4) *Coordination:* Many patients, particularly those who are inpatients at the Health Sciences Centre, are under the care of a multidisciplinary team. Patients and families often find themselves confused and frustrated having to deal with such a large bureaucratic system. To facilitate communication among all the professions involved, the social worker often acts as a case coordinator setting up case conferences for those involved in individual patient care.

II. Education:

1) *Social Work:* Oncology Social Work continues as a student field placement for the University of Manitoba, School of Social Work. During this academic year, two Bachelor of Social Work students are receiving their clinical experiences at the Foundation.

2) *Nursing:* During this academic year, B.N. students from the Faculty of Nursing, University of Manitoba were again assigned for field experience to Oncology Social Work. Thirty patients and/or families were selected for them to follow in the community. According to reports and evaluation from students, patients and staff, this program was perceived as a worthwhile endeavour and should be continued as an ongoing contribution to nursing education.

3) *Other disciplines:* Oncology Social Work continues to be involved with the education of students from other disciplines such as Radiotherapy students.

III. Other Developments

1) *Social Work — Nursing Rounds:* Following two years of weekly rounds with Chemotherapy Nurses, it is gratifying to report that similar round were started with Radiotherapy Nurses near the end of the year under review.

2) *Association with Volunteers:* During the year under review, closer liaison with the

volunteers was made possible due to the efforts of the Volunteer Coordinator. Scheduled meetings with the Mastectomy Visitation and CanSurmount groups have proven to be most beneficial for all concerned.

3) *Palliative Care Committee:* The director has been a member of this multidisciplinary committee since its formation a year ago. Regular monthly meetings were held until mid-year. Instead of planning for a Palliative Care Unit, the Committee was advised to present a proposal for a Palliative Care Consultation Team. This proposal has been submitted to senior management of the Health Sciences Centre for their consideration.

4) *Coordinating Committee:* This committee composed of Foundation middle management personnel and a few department heads was established during the year under review. The purpose of forming this committee which meets on a regular monthly basis, was to provide a channel for communication between departments where day-to-day problems and issues could be discussed.

IV. Public Relations

The department continues to provide consultation to many colleagues in the community. Many non-patient related enquiries are referred to this department for exploration and assessment.

BREAST CANCER SCREENING UNIT

Medical Director:	Dr. David Bowman
Co-ordinator:	Patricia Edward, B.S.N.
Surgeons:	Dr. Wayne Beecroft
	Dr. T. Kenneth Thorlakson
Radiologists:	Dr. George Hardy
	Dr. Harold Standing
Pathologist:	Dr. H. Yazdi
Nurse Examiners:	Madeline Blanchard
	Ann Crossin
	Jeanette Kosteniuk
	Valerie Powell
	Margaret Sawyer
	Elisabeth Weiler
Radiographers:	Norma Einarson
	Virginia Kowalski
	Barbara Moore
Secretaries	Maria DiBiase
	Romona Brown

The Manitoba Unit of the National Breast Cancer Screening Study, initiated in 1981, continues to screen volunteers for breast cancer.

The Study is designed to:

- — determine the extent to which mammography is responsible for reducing death rates in well women volunteers aged 50 to 59 years.
- — determine whether death from breast cancer is reduced in well women volunteers aged 40 to 49 who are screened by mammography and physical examination annually for five years compared to volunteers allocated to a control group.
- — analyze the contribution of various risk factors in prognosticating the development of subsequent breast cancer.
- — analyze the cost effectiveness of breast screening.
- — provide detailed information regarding the natural history of breast cancer as detected in such a regular screening programme.

During 1984, continued accrual of well women participating in the National Breast Screening Study, Manitoba Unit, exceeded the initial target of 9,000 participants, and our active recruitment and entry of new volunteers ended in April, 1984, with a total of 10,114 volunteers registered in the program.

Table III following illustrates this participation further.

TABLE III

	1984 Accrual	Cumulative Accrual (1981-1984)
Total volunteers registered	677	10,114
Total randomized to "Control"	338	5,054
Total randomized to Mammography	339	5,060
Total Cancers detected	24	85
By age group:		
40-44	03	11
45-49	05	22
50-54	08	28
54-59	08	24

Support for the screening program throughout the year by the participants was maintained with an average of 90% returns (for subsequent annual visits), and by community groups who continued to invite the program co-ordinator to discuss the program objectives and demonstrate breast self-examination techniques, and a total of 14 public presentations and 2 television interviews given.

MANITOBA INSTITUTE OF CELL BIOLOGY

Director — G. J. Goldenberg, M.D., Ph.D., F.R.C.P.(C)

A. Begleiter, Ph.D.
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J. G. Dodd, Ph.D.
J. M. Gerrard, M.D., Ph.D.
A. H. Greenberg, M.D., Ph.D.
E. D. Israels, B.A., M.Sc., M.D.
L. G. Israels, B.A., M.D., M.Sc., F.R.C.P.(C)
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S-T. Lee, Ph.D.
M. Mowat, Ph.D.
F. Paraskevas, M.D.
B. A. Schacter, B.Sc.(Med.), M.D., F.R.C.P.(C)
J. A. Wright, B.Sc., M.Sc., Ph.D.

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THE MANITOBA INSTITUTE OF CELL BIOLOGY

The Manitoba Institute of Cell Biology was founded jointly by the University of Manitoba and the Manitoba Cancer Treatment and Research Foundation in 1969. The purpose of the Institute is to carry out interdisciplinary research and training in the basic and clinical aspects of cancer and other diseases by studying disease mechanisms at a cellular level. The Institute of Cell Biology is governed by an independent Board of Management consisting of eleven members, three appointed by the University of Manitoba, three appointed by the Manitoba Cancer Treatment and Research Foundation and five jointly appointed by both sponsoring Institutions. The Manitoba Institute of Cell Biology is housed in the Manitoba Cancer Treatment and Research Foundation adjacent to the Faculty of Medicine, University of Manitoba and the Health Sciences Centre (General).

The staff of the Institute of Cell Biology consists of a Director, sixteen senior investigators, Postdoctoral Fellows, graduate students, technicians, laboratory assistants and animal attendants. Although the Institute of Cell Biology is not a degree-granting body, advanced degrees at the Masters or Ph.D. levels may be obtained by special arrangement with any of the departments in the Faculty of Medicine, University of Manitoba. The major emphasis of the research program of the Institute of Cell Biology has centered on the fields of Oncology, Hematology, Immunology and Cell Biology. Senior investigators in addition to holding appointments in the Manitoba Institute of Cell Biology also hold cross-appointments in a wide range of University departments including the Departments of Medicine, Surgery, Pediatrics, Obstetrics and Gynecology, Immunology, Biochemistry, and Physiology. Other members also have acted as Adjunct Professors in these and other basic science departments, particularly while supervising the thesis work of a graduate student pursuing an advanced degree at either the Masters or Ph.D. level.

The location of the Manitoba Institute of Cell Biology in the Manitoba Cancer Treatment and Research Foundation building has enabled the development of a program of clinical investigation of patients with neoplastic disease. Of particular interest has been the development of tumor immunology and experimental chemotherapy in which patients with a wide range of neoplastic disorders are available for investigation conducted by senior investigators in the Institute of Cell Biology. Not only is this interaction facilitated by a geographical juxtaposition of the two Institutions, but also by the fact that many senior investigators hold cross-appointments in the Manitoba Institute of Cell Biology and the Manitoba Cancer Treatment and Research Foundation.

A rather wide range of research programs was operational in 1984. Once again tumor immunology featured prominently in the research activities of the Institute. Studies continued on the role of natural antibody and natural killer cells in the immune response of the host against the tumor; evidence was obtained that interferon suppressed the sensitivity of murine lymphomas to natural killer cell-mediated host resistance. Other studies on anti-suppressor activity suggested that anti-suppression may play a pivotal role in immune stimulation and unresponsiveness. A wide-ranging program in somatic cell genetics focused on the central role that the enzyme ribonucleotide reductase may play both in differentiation and regulation of cell proliferation. Two separate studies were conducted on the synthetic anti-estrogen tamoxifen. Evidence was obtained that tamoxifen may exert its antitumor activity by binding to calmodulin. Tamoxifen was also demonstrated to inhibit transport and cytocidal activity of the alkylating agent melphalan in human breast cancer cells in vitro. The estrogen analog diethylstilbestrol was shown to produce DNA single- and double-strand breaks in mammalian cells suggesting that such breaks may play an important role in the mechanism of cell kill. Studies in experimental chemotherapy and biochemical pharmacology of cancer chemotherapeutic agents evaluated the role of free radical formation and alkylating activity in quinone-containing alkylating compounds. A major program in molecular biology was initiated in 1984 by the addition of two new staff members. These are Dr. Michael Mowat, who has a program on gene regulation in Friend erythroleukemic cells, and Dr. Janice Dodd, who is studying gene regulation in normal and malignant prostatic tissue.

To provide additional background information on the nature and type of research programs being conducted in the Manitoba Institute of Cell Biology a series of research abstracts and publications is presented for each of the senior investigators.

INVESTIGATION OF THE ANTIESTROGEN BINDING SITE

Lorne J. Brandes

We have recently synthesized a novel diphenylmethane derivative, N,N-diethyl-2-[(4 phenylmethyl)-phenoxy]-ethanamine HC1(DPPE) which binds with high affinity to the antiestrogen binding site (AEBS). Conversely, this compound demonstrates no significant interaction with estrogen receptor at or below concentrations of 1 x 10^{-5} M in rat uterine cytosol. By employing this compound as a probe, we have demonstrated that AEBS appears to contribute to the growth inhibitory action of tamoxifen on MCF-7 human breast cancer cells. At low concentrations (1 x 10^{-7} M to 1 x 10^{-6} M) DPPE demonstrates an antiproliferative effect which is significant, although less than that for tamoxifen. At high concentrations, DPPE is cytotoxic. The combination of DPPE and tamoxifen is additive and this effect is not abolished by 17 β-estradiol. This suggests that AEBS may itself mediate some of the anti-proliferative effects of tamoxifen.

DPPE is structurally similar to the aminoethyl ether group of antihistamines. Our studies now reveal that H1, but not H2 antagonists, also compete for AEBS in the order: DPPE = hydroxyzine = prochlorperazine > phenyltoloxamine > pyrilamine > diphenhydramine. The affinity of these compounds for AEBS correlates with their in vitro cytotoxicity against MCF-7 and EVSA-T human breast cancer cells. Tamoxifen, DPPE and hydroxyzine also bind to H1 receptors present in digitonin-solubilized rat liver microsomes, but with less affinity than pyrilamine. The ratio of H1 to AEBS in this preparation is 4:1. Our data suggest that the AEBS may be, in whole or in part, a receptor for histamine different from H1 and H2.

The data suggest that tamoxifen may act through AEBS as well as ER, even at lower concentrations achievable in vivo where ER-mediated inhibition appears to predominate; conversely, at higher concentrations the AEBS effect, as demonstrated by DPPE, may predominate. Our most recent findings suggest that AEBS may in fact be a growth-promoting histamine or histamine-like receptor. A precedent for this conclusion exists in the previous work of Kahlson who suggested that histamine is vital for cell function and homeostasis, and who showed that both regenerative and normal tissue and malignant tumors often demonstrate a high histamine forming capacity, the result of significantly increased histidine decarboxylase activity. In addition, he introduced the concept of "nascent" histamine to describe a high rate of endogenous intracellular histamine formation, seemingly involved in certain kinds of rapid tissue growth. A second precedent is found in the early reports of Szego who demonstrated that histamine release appears to be an early obligatory step in the end-organ response to estradiol and that this response may be blocked by some antihistamines.

It is therefore suggested that the antiestrogenic and antitumor actions of tamoxifen may relate, at least in part, to antihistaminic properties associated with two of its three rings and the alkylaminoethoxy side chain. Finally, it is apparent that DPPE may, in addition to its use as a probe to investigate the biological relevance of AEBS, possess therapeutic potential.

STUDIES ON THE MECHANISM OF ACTION OF QUINONE ANTITUMOR AGENTS

Asher Begleiter

The presence of a quinone group in the structure of a compound has been shown to produce cell kill and DNA strand breaks by a mechanism involving free radicals and active oxygen species. The ability of the compound to bind to DNA appeared to increase the DNA damage induced and the cytotoxic activity. A new series of model compounds has been used to investigate further the role of the quinone group in the mechanism of action of quinone antitumor agents.

Bis(dimethylamino)benzoquinone, which contains a quinone group, produced significant cell kill of L5178Y lymphoblasts and induced dose-dependent single strand and double strand breaks in the DNA of these cells. Benzoquinone dimustard, which possesses a quinone moiety and active alkylating groups, was approximately 2,500 times more cytotoxic to L5178Y cells than was bis(dimethylamino)benzoquinone and was approximately 200-fold more active in inducing DNA double strand breaks than was the quinone agent. Benzoquinone dimustard induced no apparent DNA single strand breaks, but produced significant DNA cross-linking, a process which interferes with the assay for single strand breaks. The cell kill by both quinone agents was inhibited by catalase, but not by superoxide dismutase. The cytotoxic activity of bis(dimethylamino)benzoquinone and two other quinone model compounds hydrolyzed benzoquinone mustard and benzoquinone mustard appeared to correlate with the induction of DNA double strand breaks induced by benzoquinone dimustard. However, the cytotoxicity of benzoquinone dimustard appeared to be related to the cross-linking activity of this agent.

These studies have provided additional evidence that the presence of a quinone group in the structure of a compound can result in significant cell kill by a mechanism that appears to involve active oxygen species. Quinone containing agents can induce DNA strand breaks and this effect is enhanced when the agent is able to bind to DNA. The induction of DNA strand breaks appeared to correlate with cytotoxic activity for bis(dimethylamino) benzoquinone, hydrolyzed benzoquinone mustard and benzoquinone mustard, but not for benzoquinone dimustard, suggesting that the contribution of quinone induced strand breaks to the overall cytotoxicity of an agent may vary considerably.

A GENETIC ANALYSIC OF NATURAL RESISTANCE TO NONSYNGENEIC CELLS: THE ROLE OF H-2

George A. Carlson, Benjamin A. Taylor, Susan T. Marshall, and Arnold H. Greenberg

The genetic control of natural resistance in vivo to four natural killer (NK) cell-resistant H-2 homozygous lymphoid tumor cell lines was investigated by following the survival and organ distribution of cells prelabeled with radioactive iododeoxyuridine. Backcross mice derived from DBA/2J and CBA/J parents were injected with H-2^d tumor cells and tumor cell elimination was lowest in H-2^d homozygotes. Natural killer cell activity was also reduced in mice with the H-2^d haplotype, but no direct correlation between NK cell levels against YAC-1 or SL2-5 lymphoma cells and natural resistance in vivo was demonstrable. Analysis of 23 BXD recombinant inbred strains indicated that natural resistance to H-2^d tumors was restricted to H-2^b strains. There was no direct association of NK cell activity with H-2 type in the BXD strains and NK cell levels did not correlate with tumor survival in vivo. By comparing natural resistance H-2^d and H-2^b tumors in DBA/2, C57BL/6, B6D2F_1, and B10.D2 mice we found that H-2 nonidentity between the tumor and the host, rather than the host H-2 haplotype, determined whether natural resistance occurred. Again NK cell activity against YAC-1 cells was not predictive of tumor survival in these strains. These results provide genetic evidence that NK cells alone cannot account for natural resistance to H-2 nonidentical cells of hemopoietic origin.

TUMOR SELECTION IN VIVO FOR REDUCED SENSITIVITY TO NATURAL RESISTANCE AND NATURAL ANTIBODIES

Donna A. Chow

The contribution of natural antibodies (NAb) to the selective elimination of tumor variants in vivo was studied to further support the hypothesis that NAb participate in host-mediated natural resistance (NR) against neoplasia. Tumors obtained after the sc, ip, or iv inoculation of the natural killer cell-resistant, natural antibody-sensitive L5178Y-F9 tumor clone into syngeneic DBA/2 mice were tested for their sensitivity to NR in the ^{131}I 5-iodo-2'-deoxyuridine elimination assay and to serum NAb in the presence of complement. Cells removed from the ip or sc sites of tumor inoculation exhibited a reduced susceptibility to syngeneic NR and to syngeneic but not to allogeneic NAb. Tumors recovered form the spleen, brain, and lungs after iv inoculation also expressed a decreased sensitivity to both syngeneic NR and NAb. These data suggest that NR against tumors is widely disseminated and support the hypothesis that NAb participate in this antitumor defense, including the control of metastatic spread of disease. Tumors previously selected in vivo also exhibited reduced sensitivity to complement-mediated lysis by NAb acquired in the peritoneum. The correlation observed between this sensitivity to complement and the recovery of tumor cells after the ip injection of L5178Y-F9 contribute to the evidence that NAb acts in vivo.

VARIANT GENERATION AND SELECTION: AN IN VITRO MODEL OF TUMOR PROGRESSION

Donna A. Chow

Evidence for a new in vitro model of tumor progression was sought on the basis of the variant generation and selection hypothesis. The stability of a cloned murine tumor was examined during growth in standard tissue culture or in media containing the tumor promotor 12-0-tetradecanoylphorbol-13-acetate (TPA). Analysis of subclones from the appropriate tumor populations revealed the growth of the L5178Y-F9 clone in 100 ng/ml TPA and 0.1% dimethyl sulphoxide (DMSO) for 2 days yielded a tumor which exhibited increased cellular heterogeneity for susceptibility to both syngeneic and allogeneic natural antibodies (NAb). Subsequent exposure of TPA- and DMSO-treated cells to two cycles of syngeneic NAb-mediated cytolysis resulted in tumor populations which expressed a reduced sensitivity to syngeneic NAb. Thus the elements of tumor variant generation and selection were demonstrated by means of this approach, and repeated cycles of the TPA treatment and NAb cytolysis produced tumor cells with a reduced susceptibility not only to NAb in vitro but also to anti-tumor natural resistance (NR) measured in a tumor elimination assay in vivo. These observations extend the support for the notion that tumor progression can proceed through variant generation and selection. Furthermore, the association of tumor variant generation with exposure to the combination of TPA and DMSO, both non-mutagens, offers a model for studying non-mutagenic mechanisms of tumor development.

INVOLVEMENT OF RIBONUCLEOTIDE REDUCTASE IN CELLULAR DIFFERENTIATION

David C. Creasey and Jim A. Wright

L_6 and L_8 rat myoblast cell lines have been selected for resistance to hydroxyurea, an antineoplastic agent whose intracellular target is the rate-limiting enzyme activity of DNA synthesis, ribonucleotide reductase. In contrast to the differentiation-competent parental lines from which they were selected, the drug-resistant lines exhibit a grossly altered or absent myogenic capacity. Independent selections have revealed a strong correlation between changes in ribonucleotide reductase, as determined by velocity levels and product pool analyses, and altered myogenic potential. These results provide the first indication that alterations in this key enzyme activity and its acompanying deoxyribonucleoside triphosphate pools can affect cellular differentiation. It is relevant to note that reprogramming of gene expression during neoplastic transformation can be viewed as a problem in cellular differentiation.

HUMAN DIPLOID FIBROBLASTS WITH ALTERATIONS IN RIBONUCLEOTIDE REDUCTASE ACTIVITY, DEOXYRIBONUCLEOTIDE POOLS IN VITRO LIFESPAN

John E. Dick and Jim A. Wright

Three drug resistant human diploid fibroblast clones were isolated which contained elevated levels of ribonucleotide reductase activity when compared to wild type fibroblasts. The drug resistant cells do not appear to possess an enzyme with altered affinity for hydroxyurea. The increase in enzyme activity can entirely account for cellular drug resistance. In keeping with the observed changes in reductase activity in drug resistant fibroblasts, deoxyribonucleotide pools were also found to be altered. Most significantly, there was a 1.8-fold expansion of the dCTP pool size, suggesting that elevation in intracellular dCTP concentrations plays an important role in cellular resistance. Furthermore, the drug resistant fibroblasts exhibited substantial reductions in their replicative abilities, suggesting that the regulation of ribonucleotide reductase and the accompanying deoxyribonucleotide pools in human diploid cells is involved in aspects of cellular senescence.

REGULATION OF GENE EXPRESSION IN THE HUMAN PROSTATE

Janice G. Dodd and Robert J. Matusik

The prostate gland is controlled by the interaction of several hormonal and non-hormonal factors. Androgens are potent stimulators of both mitotic activity and secretory function. In addition, zinc is essential for normal prostatic development and seems to be critical for fertility. There is a need to define these complex interactions at the molecular level if we are to understand prostatic function and disease. An approach to understanding prostatic function which has worked successfully in studies of the rat animal model has been the cloning and characterization of the genes which are specifically expressed by prostatic cells. One recently characterized rat prostatic cDNA clone, designated pM-40, is unusual in that it is both androgen and zinc regulated at the mRNA level. It is expressed at high levels in the epithelial cells of the rat lateral prostate which localizes the highest concentration of zinc of any body tissue. Preliminary evidence indicates that this unusual gene may code for an abundant nuclear protein which is unique to prostatic cells. Particularly exciting is the finding that the rat pM-40 clone will cross-hybridize with mRNA from human prostatic tissues. This indicates that the gene is conserved between rat and human and that it is expressed in human prostatic cells which suggests a crucial role in prostatic function. Presently, a cDNA library is being constructed using mRNA from human prostate tissues. The library will be screened to identify clones which are specifically and abundantly expressed in the human prostate. In particular, the rat pM-40 clone will be used to identify the human gene counterpart so that it may be assessed as a potential molecular marker for prostatic function and disease in man.

MECHANISM OF ACTION OF HEME OXYGENASE: A STUDY OF HEME DEGRADATION TO BILE PIGMENT BY $^{18}0$ LABELLING

J. C. Docherty, B. A. Schacter, G. D. Firneisz, and S. B. Brown

The formation of bile pigment from heme by a reconstituted heme oxygenase system containing purified bovine spleen heme oxygenase, NADPH-cytochrome P-450 reductase and biliverdin reductase was studied under an atmosphere containing $^{18}0_2$.

The product, bilirubin, was isolated and subjected to mass spectrometry, which revealed incorporation of $^{18}0$ consistent with a two-molecule mechanism, whereby the product bile pigment contains oxygen atoms derived from two different oxygen molecules. The studies also demonstrated that the formation of hydrogen peroxide in the reconstituted enzyme system does not influence the mechanism of oxygen insertion in bile pigment formation by heme oxygenase. The results are consistent with previous studies using living rats and microsomal preparations and lend further support to the concept that heme oxygenase is the enzyme primarily responsible for bile pigment formation in animals.

Jonathan Gerrard

1. Studies of Patients with Bleeding Disorders

Our studies of patients with bleeding disorders have been directed at answering two different questions: A) What is the relative contribution of various known alterations in platelets, coagulation proteins or erythrocytes to the bleeding tendency of patients who present with a susceptibility to bleed? B) Can we apply recent advances in understanding how platelets work in our determination of the specific biochemical defect in previously poorly understood bleeding disorders?

To provide an overview of the relative contribution of various platelet coagulation protein or erythrocyte parameters to bleeding susceptibility, we have analyzed the results of studies on 569 patients. We found an association between the length of the bleeding time and the following parameters with the strength of the association being in the order the parameters are listed: 1) The level of thromboxane B_2 in the bleeding time blood, 2) The percent of platelet adhesion to a column of glass beads, 3) The hematocrit, 4) The extent of platelet aggregation with collagen, 5) The age of the patient, 6) The extent of platelet aggregation to epinephrine, 7) The number of platelets in the blood, 8) The extent of prothrombin consumption and 9) The amount of von Willebrand factor activity in the blood. Our studies suggest that thromboxane B_2 is an important new variable to consider in assessing an individual's tendency to bleed, and that the importance of the hematocrit and age, although considered previously, may have been underrated. The reason for the considerable shortening of the bleeding time with increasing age is uncertain, but is being further explored. In the meantime, we have learned that we must use caution when applying to children normal values obtained from adults.

We are currently exploring the biochemical defect in the platelets or platelet function of several individuals including: 1) A patient with abnormal aggregation and defective function but normal amounts of glycoproteins IIb and III, 2) A patient with apparently defective (increased) PGI_2 production, 3) A patient with decreased lysophosphatidic acid formation in his platelets and 4) A patient with platelets which apparently have not separated properly from each other during the process in which they budd off from the precursor megakaryocyte. Further studies are continuing in each instance.

2. Studies of the Fundamental Nature of How Platelets Work

Our investigation into the nature of platelets has focused in 1984 on a group of phospholipids, the phosphoinositides, and the products produced when the phosphoinositides are rapidly metabolized in stimulated platelets. We have studied the effects of one of these products, inositiol tris phosphate (IP_3), on platelets which are specially treated to render them permeable to this substance. Platelets were found to respond to IP_3 in a fashion similar to agents known to activate platelets by causing a rise in cytoplasmic calcium (i.e.: activation of the platelet actin-myosin internal contractile response with a change in cell shape and a rearrangement of granules followed by aggregation). In contrast to the effects of IP_3, oleoyl-acetyl diglyceride, a synthetic analog of the natural diglyceride produced when platelet phosphoinositides are metabolized, was found to produce a selective fashion of platelet granules, leading to the formation of large intracellular vacuolar structures and the secretion of granule contents, and then to platelet aggregation. These findings suggest that the IP_3 and diglyceride produced on phosphoinositol breakdown facilitate platelet secretion and platelet aggregation.

Lysophosphatidic acid, another product (though indirectly) following phosphoinositide breakdown, was found to act in a manner similar to that of IP_3. The relative role of lysophosphatidic acid compared to IP_3 and diglyceride in platelet responses is being further explored.

ANTAGONISM OF THE CYTOCIDAL ACTIVITY AND UPTAKE OF MELPHALAN BY TAMOXIFEN IN HUMAN BREAST CELLS IN VITRO

Gerald J. Goldenberg and Evelyn K. Froese

The effect of the antiestrogen tamoxifen on the cytocidal activity and uptake of melphalan in human breast cancer cells was investigated. A clonogenic assay was used to obtain dose-survival curves of estrogen receptor-positive MCF-7 cells and of estrogen receptor-negative Evsa T cells following treatment with melphalan and/or tamoxifen. Isobolograms derived from these dose-survival curves were concave downward, suggesting that the drug interaction was antagonistic. The effect of tamoxifen on melphalan uptake by breast cancer cells was evaluated at steady-state conditions. Thin-layer chromatography revealed that the intracellular level of free intact melphalan (mean ± S.E.) in control cells was 6.47 ± 1.21 fmoles/cell and that in cells treated with tamoxifen was 3.60 ± 0.35 fmoles/cell; this 44% reduction in cellular melphalan was statistically significant ($p=0.006$). Thus the antagonistic cytocidal effect of melphalan and tamoxifen against breast cancer cells appeared to be due to inhibition of melphalan uptake at the steady state by the antiestrogen. Further investigation revealed that tamoxifen inhibited unidirectional melphalan influx in human breast cancer cells both by the sodium-dependent system L and by the sodium-dependent system ASC. Tamoxifen also appeared to stimulate melphalan efflux from human breast cancer cells. The first-order rate constant K for melphalan efflux from control cells was 0.085 ± 0.008 and that from cells treated with tamoxifen was 0.129 ± 0.005; the difference was highly significant ($p < 0.001$). Therefore, the antagonistic effect of tamoxifen on the uptake and cytocidal activity of melphalan in breast cancer cells appeared to be due to inhibition to melphalan influx and stimulation of drug efflux.

INDUCTION OF DNA SINGLE- AND DOUBLE-STRAND BREAKS BY DIETHYLSTILBESTROL IN MURINE L5178Y LYMPHOBLASTS IN VITRO

Gerald J. Goldenberg and Evelyn K. Froese

The mechanism of action of the synthetic estrogen diethylstilbestrol (DES) was investigated in murine L5178Y lymphoblasts. The dose-survival curve of cells treated with DES in serum-free medium for 1 hr was characterized by a prominent shoulder followed by a simple exponential decline: the D_0, the dose of DES reducing cell survival to l/e, was 1.52 nmoles/ml. DNA single-strand breaks, as measured by the alkaline elution method, were observed in DES-treated cells, and these followed a dose-response relationship after an apparent threshold of 10 μM DES was exceeded. Protein-associated strand breaks, which represent the increment in single-strand breaks that occurs by exposing drug-treated cells to proteinase K were also noted. DNA double-strand breaks as measured by filter elution technology at pH 9.6 were observed and increased markedly to reach a level of approximately

9000 rad equivalents at a DES concentration of 20 μM. The measured ratio (mean ± S.E.) of single- to double-strand breaks induced by DES in L5178Y lymphoblasts was 0.09 ± 0.035. A comparison of the ratio of single- to double-strand breaks induced by DES to that observed following radiation suggested that all of the single-strand breaks produced by DES could be attributed to double-stand breaks. The close correspondence of the dose-response curve for cytocidal activity of DES with that obtained for induction of DNA double-strand breaks suggested that such breaks may play an important role in the mechanism of cell kill by DES.

ACTIVATION OF LOBSTER HEMOCYTES FOR PHAGOCYTOSIS

Perry Z. Goldenberg, Erwin Huebner, and Arnold H. Greenberg

Activation of lobster (Homarus americanus) hemocytes for phagocytosis of sheep erythrocytes (SRBC) was demonstrated in vitro by incubation with lipopolysaccharide and by prolonged adherence to glass coverslips. Morphological changes, which preceded phagocytic activation, were detected by phase microscopy and Nomarski interference microscopy. These included spreading, the formation of filopodia and pseudopodia, granular darkening and dispersion, and vacuolation. Hemolymph serum opsonin greatly enhanced the recognition and phagocytosis of SRBC by activated hemocytes. Increases of 15 to 20 times background levels were observed both in the proportion of hemocytes which were actively phagocytic, and the percent of rosette-forming hemocytes. This suggested that the enhanced phagocytosis was the result of both the recruitment of a quiescent precursor population during activation, and an increase in the availability of opsonin binding sites on hemocyte membranes.

NEUROHORMONAL MODULATION OF NATURAL RESISTANCE TO A MURINE LYMPHOMA

Arnold H. Greenberg, Dennis G. Dyck, Lorna S. Sandler, Bill Pohajdak, K. Michael Dresel, and Derek Grant

The hypothesis that neuroendocrine stimulation after aversive handling can alter natural resistance was examined in the tail electroshock (TES) model, a procedure that can activate pituitary neuropeptide secretion. Immediately after a brief TES session, the resistance of DBA/2J mice was suppressed in proportion to the intensity of the shock. Initial suppression of the natural resistance was rapidly reversed in longer treatment protocols, and repeated aversive stimulation augmented the antitumor response, leaving the mice more resistant to lymphoma than unhandled animals. Corticosterone was released into the serum after all acute handling procedures, and hydrocortisone inoculation suppressed antitumor responses. However, serum corticosterone levels did not quantitatively correlate with the alterations in natural resistance. The observations that TES-induced suppression of natural resistance could be reversed by the opiate receptor antagonist naltrexone suggested that endogenous opiates released after TES stimulation were immunosuppressive.

SUPPRESSION OF NK-MEDIATED NATURAL RESISTANCE BY INTERFERON TREATMENT OF MURINE LYMPHOMAS

Arnold H. Greenberg, Veronica Miller, Ted Jablonski, and Bill Pohajdak

The observation that interferon (IFN) can suppress the NK lytic sensitivity of murine lymphomas in vitro led us to examine the consequences of this treatment on tumor behaviour in vivo. Preincubation in IFN suppressed natural resistance to two lymphomas in syngeneic DBA/2 and semisyngeneic BDF1 mice in a dose-dependent manner, measured by the retention of ^{131}I dUrd-labelled tumor. Poly I:C enhancement of NK-mediated natural resistance in the lung, liver, and peritoneal cavity was abolished by IFN pretreatment. IFN was, however, ineffective in altering the elimination of the IFN-resistant $L1210_R$ lymphoma when competed to its IFN-sensitive variant, $L1210_S$. In DBA/2 mice that were made NK-deficient by treatment with cyclophosphamide or rabbit anti-asialo GM1 antiserum, or in congenitally NK-deficient bg/bg strain mice, IFN-treated tumor and control tumor were rejected equally well. This indicated that the effects of IFN were dependent on the presence of NK cells in these mice, and suggests that the IFN suppressed the sensitivity of the lymphomas to NK cell-mediated host resistance.

RIBONUCLEOTIDE REDUCTASE ACTIVITY IN INTACT MAMMALIAN CELLS: STIMULATION OF ENZYME ACTIVITY BY $MgC1_2$, DITHIOTHREITOL, AND SEVERAL NUCLEOTIDES

Robert G. Hards and Jim A. Wright

An intact cell assay system based on Tween-80 permeabilization was used to investigate ribonucleotide reductase activity in Chinese hamster ovary cells. Dithiothreitol, a reducing agent, is required for optimum activity. Analysis of diethiothreitol stimulation of CDP and ADP reductions indicated that in both cases the reducing agent served only to increase the reaction rate without altering the affinity of the enzyme for substrates. Magnesium chloride significantly stimulated the reduction of CDP but not ADP; this elevation in CDP reduction was due to an increase in both the affinity of the enzyme for substrate and the V_{max}. In addition to ATP and dGTP, well known activators of CDP and ADP reductase activities, it was found that dCTP and GTP were also able to activate CDP and ADP reductase activities, respectively. For the dCTP-activated reaction the V_{max} was 0.158 nmol dCDP formed 5×10^6 cells^{-1} h^{-1} and the K_m was 0.033 nM CDP, while the GTP-activated reduction a V_{max} of 0.667 nmol dADP formed 5×10^6 cells^{-1} h^{-1} and a K_m of 0.20 mM ADP observed. Kinetic analysis revealed that dCTP, dGTP, and GTP stimulate ribonucleotide reduction solely by increasing the affinity of the enzyme substrate without affecting the V_{max} of the respective reactions. ATP behaves in a different manner as it stimulates CDP reduction by altering both the affinity of the enzyme for substrate and the V_{max}. Cellular concentrations of ribo and deoxyribonucleotide di- and triphosphate pools were measured to help evaluate the relative physiological importance of the nucleotide activators. These determinations, along with the reaction kinetic studies, strongly imply that ATP is a much more important regulator of CDP reduction than dCTP, whereas GTP may serve as well or better than dGTP as the in vivo activator of ADP reduction.

REGULATION OF RIBONUCLEOTIDE REDUCTASE ACTIVITY IN INTACT MAMMALIAN CELLS

Robert G. Hards and Jim A. Wright

An intact cell assay system based upon Tween-80 permeabilization was used to investigate the regulation of ribonucleotide reductase activity in Chinese hamster ovary cells. Models used to explain the regulation of the enzyme have been based upon work carried out with cell-free extracts, although there is concern that the properties of such a complex enzyme would be modified by extraction procedures. We have used the intact cell system to evaluate, within whole cells, the current model of ribonucleotide reductase regulation. While some of the results agree with the proposals of the model, others do not. Most significantly, it was found that ribonucleotide reductase within the intact cell could simultaneously bind the nucleotide triphosphate activators for both CDP and ADP reductions. According to the model based upon studies with cell-free preparations, the binding of one of these nucleotides should exclude the binding of others. Also, studies on intracellular enzyme activity in the presence of combinations of nucleotide effectors indicate that GTP and perhaps dCTP should be included in a model for ribonucleotide reductase regulation. For example, GTP has the unique ability to modify through activation both ADP and CDP reductions, and synergistic effects were obtained for the reduction of CDP by various combinations of ATP and dCTP. In general, studies with intact cells suggest that the in vivo regulation of ribonucleotide reductase is more complex than predicted from enzyme work with cell-free preparations. A possible mechanism for the in vivo regulation of ribonucleotide reductase, which combines observations of enzyme activity in intact cells and recent reports of independent substrate-binding subunits in mammalian cells has been proposed.

CONCANAVALIN A BINDING TO FIBROBLASTS FROM DUCHENNE MUSCULAR DYSTROPHY PATIENTS AND AGE-MATCHED CONTROLS

M. Hellman, J. C. Jamieson, C. L. J. Parfett and J. A. Wright.

An investigation of [^{25}I] Con A binding to skin fibroblasts from Duchenne muscular dystrophy patients and age-matched controls was carried out. The age groups examined were 5-6 years, 11-12 years, and 15-17 years. Only small differences in binding abilities were observed between dystrophic cells and matched controls. When data was examined as μg Con A bound/μg protein, dystrophic fibroblasts bound slightly more lectin compared to controls with the 5-6 and 11-12 year age groups, whereas the 15-17 years age group bound slightly less Con A compared to normal controls. However, analysis of binding data as lectin bound/cell showed slightly reduced binding of Con A to dystrophic cells from all age groups when compared to matched controls. It was also found that the amount of Con A bound by both normal and dystrophic fibroblasts markedly increased with the age of the donor. Obviously several factors must be taken into account when analyzing lectin binding data obtained with human fibroblasts. Taken as a whole, our studies do not provide evidence for significant modification of cell surface Con A receptors on fibroblasts from Duchenne muscular dystrophy patients.

VITAMIN K_1 AS A MODULATOR OF BENZO(A)PYRENE METABOLISM AS MEASURED BY IN VITRO METABOLITE FORMATION AND IN VIVO DNA — ADDUCT FORMATION

L. G. Israels, D. J. Ollman and Esther D. Israels

Vitamin K_1 (2-methyl-3-phytyl-1,4-napthoquinone) increases the microsomal metabolism of benzo(a)pyrene in rat liver microsomes in vitro. The increase is most marked in the 9,10 diol, 7,8 diol and 3-OH metabolites. The effect is seen at an in vitro concentration of 25 μM and disappears at higher concentrations of K_1. The production of hepatic BP metabolite — DNA adducts in vivo in IcR/Ha mice is reduced in K deficient mice and this effect is reversed by vitamin K_1. These findings are consistent with the role of vitamin K_1 as a regulator of the microsomal mixed function oxidase system. They also suggest a reason for the low intracellular content and total body stores of K_1 and a possible explanation for the even lower vitamin K levels in the fetus and newborn.

THE EFFECTIVENESS OF 2'-DEOXYCOFORMYCIN IN THE TREATMENT OF HAIRY CELL LEUKEMIA

James B. Johnston

Six patients with hairy-cell leukemia (HCL) received three treatments with 2'-deoxycoformycin (DCF) (4 mg/M^2, I.V.) at weekly intervals, followed by DCF at 3 to 4 week intervals. There was a rapid return to normal blood counts, with concomitant reduction in the marrow hairy-cell population in the four patients who had previously been splenectomized, or had moderate splenomegaly. Two patients with massive splenomegaly demonstrated reductions in spleen size and improvements in the peripheral granulocyte counts and hemoglobin levels. DCF did not depress the granulocyte or platelet counts, but the initial treatment produced a 1-3 gm/dl decrease in hemoglobin. 4 mg/M^2 DCF ablated the peripheral mononuclear cell adenosine deaminase activity, but this dosage caused mild to moderate nausea/vomiting and associated lethargy in four patients. There was no correlation between the plasma levels of deoxyadenosine or adenosine and the incidence or severity of these symptoms. In one patient, in whom it was possible to measure hairy-cell deoxyATP content, the levels of this nucleotide rose from <1 pmol/10^6 cells to >200 pmol/10^6 cells 24 hours following DCF. This biochemical perturbation may account for the antitumor activity of this drug in HCL.

CLINICAL STUDIES WITH DDAVP

Nathan L. Kobrinsky

We have shown that DDAVP, a synthetic analogue of vasopressin, shortens the bleeding time in subjects with von Willebrand disease, platelet function defects, other disorders characterized by a long bleeding time and normal subjects. Based on these observations, a prospective double blind controlled study is ongoing to investigate the potential role of DDAVP in decreasing blood loss in hemostatically normal individuals undergoing spinal fusion surgery. Anticipated completion of the study is June 1985.

We have recently demonstrated that the Factor VIII response to DDAVP is absent in subjects with Nephrogenic Diabetes Insipidus. This implies a ubiquitous distribution of the anti-diuretic hormone (ADH) receptor in the body. One of the physiologic roles of such a receptor could be major fluid shifts between the intracellular and extracellular fluid compartments. A corresponding pathologic role could be the 'sick cell syndrome' associated with the shock state. Current studies are designed to test this hypothesis and, if confirmed, to investigate the role of potential ADH-receptor blockers such as Lithium and Lanthanum in the treatment of septic shock in an animal model.

The finding of the ADH-receptor in many tissues including vascular endothelium lead to the speculation that similar receptors may exist on malignant cells. Accordingly, the effect of DDAVP on chemotherapy uptake by leukemic cells in vitro was investigated by Dr. G. Goldenberg's laboratory. Striking effects were demonstrated raising the possibility that DDAVP could be used as a biological response modifier in the treatment of malignant disease with chemotherapy. Ongoing in vitro work attempts to define more specifically the mechanisms involved. Further studies are planned to investigate the effects of DDAVP on melphalan-induced neuroblastoma cytotoxicity.

ANTENATAL TREATMENT OF ERYTHROBLASTOSIS FETALIS BY MATERNAL ADMINISTRATION OF HIGH DOSE INTRAVENOUS GAMMA—GLOBULIN

Nathan L. Kobrinsky

This study, approved by the Committee for the Use of Human Subjects in Research, has been generously funded by the Children's Hospital Research Foundation and the Manitoba Medical Service Foundation, Inc. The study will begin as soon as an appropriate patient is identified.

THE EFFECTS OF ENDOTHELIAL CELLS ON HEMATOPOIESIS

Nathan L. Kobrinsky

Two papers on the role of the microenvironment on hematopoiesis have been submitted. Ongoing work with Dr. Jonathan Gerrard is investigating the role of the microenvironment on wound healing. The observation in an animal model that fibrinolytic inhibitors augment the normal healing process is being addressed specifically.

IRON DEFICIENCY LOWERS THE SEIZURE THRESHOLD IN CHILDREN

Nathan L. Kobrinsky

This study was based on the curious clinical observation that children with febrile seizures are often iron deficient. Further, the age specific incidence for iron deficiency and febrile seizures is strikingly similar. Accordingly, a retrospective case-control study is ongoing. If the hypothesis is confirmed, a prospective study is planned.

HYDROXYUREA STIMULATES THE NEUTROPHIL RESPONSE IN CHILDREN WITH CONGENITAL NEUTROPENIA

Nathan L. Kobrinsky

Recently, chloramphenicol has been shown to stimulate the neutrophil response in children with congenital neutropenia. Because of unacceptical toxicity (i.e. blindness) the drug had to be discontinued in one affected patient on chloramphenicol therapy. We proposed that the mechanism of chloramphenicol's action was quite non-specific and related more to its direct myelosuppressive properties. Accordingly, the patient was treated with a much less toxic myelosuppressive agent, vis. hydroxyurea, and demonstrated a neutrophil response similar to that observed with chloramphenicol. If confirmed in other affected patients, this therapy represents a relatively non-toxic 'cure' for this extremely morbid and life threatening condition.

MECHANISM OF ACTION OF TAMOXIFEN

H. Y. P. Lam

The mechanism of action of tamoxifen, a triphenylethylene antiestrogen with antitumor activity, has not been fully established. We have obtained evidence that tamoxifen is an antagonist of calmodulin, a major cellular receptor and calcium dependent regulator of many cellular processes. Our data showed that tamoxifen inhibited the activation of phosphodiesterase by calmodulin. This inhibition could be overcome by an increase in calmodulin concentration. Kinetic analysis demonstrated that tamoxifen is a competitive inhibitor of calmodulin in the activation of this enzyme. It could be speculated that the antagonism of calmodulin by tamoxifen may be one of the mechanisms responsible for its pharmacological actions.

ACTIVATION IN VIVO OF A MAJOR ANTISUPPRESSOR T-CELL PATHWAY IMMEDIATELY AFTER IMMUNIZATION

II. T-Cell Reuirements for its Expression

S-T. Lee, F. Paraskevas, and J. Maeba

Immunogens activate in vivo within 3-6 hr after injection a new and hitherto unrecognized T-cell pathway which interferes with T-cell suppression, therefore called antisuppression. An important soluble mediator with antisuppressor activity is detected in the serum of immunized animals within 3-6 hr. The mediator represents a unique form of complexes of Ig and antigen. The antisuppressor function of the complexes does not represent a direct "neutralizing" effect of the complexes on the effector T suppressor cells. The antisuppressor complexes activate an Ly2^{+} T cell which, with the interaction of an Ly123^{+} T cell, blocks completely T-suppressor-cell function. The biological significance of the T antisuppressor pathway is discussed.

STUDIES OF THE INTERACTION BETWEEN CALMODULIN AND CYCLIC NUCLEOTIDE PHOSPHODIESTERASE

Bulent Mutus, Kuo-che Wang, Rajendra K. Sharma, H-Y. Peter Lam, and Jerry H. Wang

The calmodulin-dependent cyclic nucleotide phosphodiesterase (PDE) has frequently been used as a probe to elucidate the mechanism of calmodulin action. An early postulate suggests that the enzyme activation involves the binding of Ca^{2+} to calmodulin, which induces an active conformation of the protein and then the association of the active calmodulin with the phosphodiesterase results in enzyme activation. Although the postulate is compatible with most of the experimental data, the implication that the enzyme and calmodulin do not interact in Ca^{2+}-free media contradicts thermodynamic principles. By considering the free energy coupling for the binding of Ca^{2+} and PDE to calmodulin, the reaction between the two proteins, albeit weak, would have to occur in the absence of Ca^{2+}. However, attempts to demonstrate the formation of the protein complex by physical techniques have not been successful.

Although significant progress has been made toward understanding the dynamic interactions between Ca^{2+}, calmodulin, and cyclic nucleotide PDE for enzyme activation, the molecular basis of the reaction is much less understood. One of the salient features of calmodulin as a regulatory factor is the ability of the protein to associate and to regulate many enzymes and proteins. When the calmodulin concentration is limited, the various calmodulin-regulated proteins would compete with one another for binding if the proteins bound at a common site on calmodulin. Alternatively, they might contain a common or closely similar domain for the binding of calmodulin. Approaches to studying this putative calmodulin binding domain(s) have yet to be developed.

We have prepared a fluorescence-labeled cyclic nucleotide PDE that we used to study the interaction between calmodulin and PDE. Using this enzyme derivative, it has been possible to demonstrate and to determine the equilibrium constant of the interaction between calmodulin and the PDE in media containing little Ca^{2+}. We have also developed a monoclonal antibody of cyclic nucleotide PDE that is capable of reacting with several other calmodulin-dependent proteins. This and other similar monoclonal antibodies may be used to explore the calmodulin binding domains in calmodulin-regulated proteins.

REARRANGEMENTS OF THE CELLULAR p53 GENE IN ERYTHROLEUKEMIC CELLS TRANSFORMED BY FRIEND VIRUS

Michael Mowat, Ambrose Cheng, Nobuhiro Kimura, Alan Bernstein and Samuel Benchimol

There is now good evidence to indicate that the cellular protein, p53, is involved in the transformation process although its precise role is not understood. Recently it was reported that expression of the p53 gene can immortalize cells and that the p53 gene can replace *myc* in a *myc-ras* immortalization/transformation assay. In an effort to determine whether p53 plays a role in the progression towards the neoplastic state *in vivo* we have turned to the erythroleukemias induced by different isolates of Friend leukemia virus. We report here that erythroleukemic cell lines transformed by Friend virus show altered expression of the cellular p53 gene. High levels of p53 protein are found in certain lines, whereas in other cells, p53 protein cannot be detected. This heterogeneity in p53 gene expression is associated with heterogeneity in tumourigenicity. We demonstrate that genomic rearrangements are responsible for p53 gene inactivation in these cell lines. Furthermore, these p53 gene rearrangements occur *in vivo* during the natural progression of Friend virus induced erythroleukemia.

ACTIVATION IN VIVO OF A MAJOR ANISUPPRESSOR T-CELL PATHWAY IMMEDIATELY AFTER IMMUNIZATION

I. Its Regulation by I-A Gene Products

F. Paraskevas, S-T. Lee, J. Maeba, and C. S. David

It has previously been demonstrated that within 6 hrs after immunogenic stimulation the serum of mice contains a unique form of immunogenic antigen which represents complexes of Ig and antigen. The complexes are known to be strongly cytophilic for $Ly2^+$ Ia^+ FcR^+

T cells and markedly enhance the IgG response. Anti-I-A treatment of mice suppresses the IgG antibody response and results in the generation of antigen specific T suppressor cells (Ts). Furthermore, anti-I-A treatment blocks the induction of the complexes and abolishes the enhancing effect the complexes exert on the IgG antibody response. The 6-hr cytophilic complexes were shown to block the function of Ts and allow a normal IgG response to take place; therefore, they act as mediators of a novel T-cell pathway called antisuppression. The blocking of the induction of the antisuppressor complexes by anti-I-A antibody was at least in part due to an effect on T cells. In conclusion, products of genes of the I-A subregion of the MHC control the activation early after immunization of a T-cell pathway which is called antisuppression since its major function is interference with the expression of suppression. Its early induction (within 6 hr) suggests that antisuppression may play a pivotal role in determining between immunity and unresponsiveness.

ACTIVATION IN VIVO OF A MAJOR ANTISUPPRESSOR T-CELL PATHWAY IMMEDIATELY AFTER IMMUNIZATION

III. T-Cell Requirements for Its Induction

F. Paraskevas, S-T. Lee, and J. Maeba

Immunogenic stimuli rapidly induce a potent mediator with antisuppressor activity which represents complexes of Ig and antigen. The formation of the complexes depends on the interaction of two T cells both of which bear the Ly1 phenotype. The two T cells can be separated on the basis of their sensitivity to antilymphocytic serum and dependence on the presence of thymus. T cells bearing I region coded determinants are essential for the formation of the mediator.

TUMOR-ACTIVATED NK CELLS TRIGGER MONOCYTE OXIDATIVE METABOLISM

Pohajdak, B., Gomez, J. and Greenberg, A. H.

We have examined the hypothesis that tumor cells can stimulate a respiratory burst by human natural killer (NK) cells in vitro as measured by luminol-dependent chemiluminescence (CL). Percoll-purified NK cells, containing 40% HNK-1^+ cells and $<$ 1 to 4% esterase-positive contaminating monocytes, can generate a strong CL response after stimulation with the NK-susceptible K562 tumor but not with the NK-resistant P815 tumor cells. Although the response was NK dependent, as shown by depletion with NK-directed monoclonal antibodies (HNK-1, OKT-11, and OKM-1), the cell generating the CL response was not the NK cell. On the basis of several independent experimental approaches the CL response always required the presence of monocytes in the NK preparation. a) Treatment with a monocyte-specific monoclonal antibody (MO2) and complement completely abolished CL. b) The cells producing the CL response were strongly adherent to nylon wool columns (NWC), and large granular lymphocyte preparations containing $<$ 0.1% esterase-positive cells were inactive. c) NK cells cultured in IL2 containing medium and tested over several days did not generate CL. d) Optimal numbers of monocytes ($<$ 1 to 2%) added to a non-CL NWC-purified NK population restored CL, whereas larger or smaller amounts were ineffective. Neither these procedures nor the addition of superoxide dismutase (which completely blocked CL) had any effect on NK lytic activity. We subsequently demonstrated that a factor present in supernatants obtained from NK/K562 incubations, but not from NK or tumor cells alone, could stimulate monocyte CL. We therefore propose that the CL response measured in NK-enriched Percoll fractions originated from contaminating monocytes that were triggered by factor(s) released from tumor-activated NK cells, and that superoxide anion was not required for NK lysis.

AN OLIGOSACCHARIDE BIOSYNTHETIC DEFECT IN CONCANAVALIN A-RESISTANT CHINESE HAMSTER OVARY (CHO) CELLS THAT ENHANCES NK REACTIVITY IN VITRO AND IN VIVO

Bill Pohajdak, Jim A. Wright, and Arnold J. Greenberg

We have examined a concanavalin A-resistant (Con A^R) Chinese hamster ovary cell (C^R-7) that has a defect in the synthesis of asparagine-linked oligosaccharides and consequently an altered expression of membrane carbohydrate. The C^R-7 mutant, which has a decreased ability to incorporate mannose into obligolipid and membrane glycoprotein and an increased membrane fucose, was more sensitive to natural killer (NK) cell lysis than the parental wide type (CHO-WT). Splenocytes mediating the lysis of the C^R-7 line were asialo GM_1^+, nonadherent, IFN stimulatable absent in the bg/bg mutant, and cofractionated on Percoll density, gradients with cell mediating lysis of the YAC-1 murine lymphoma. The increase in NK lysis correlated with enhanced binding of NK cells to the mutant determined by adsorption on tumor monolayers, cold target inhibition, and target binding analysis. A revertant of C^R-7 (RC^R-7), which showed wild-type levels of NK lysis, was intermediate in its ability to bind or cold target inhibit NK cells. The C^R-7, CHO-WT, and RC^R-7 lines were equally sensitive to hypotonic lysis and cytotoxicity by human lymphokine -activated killer (LAK) cells suggesting that the mutation did not non-specifically alter membrane fragility. The NK-sensitive C^R-7 line was less tumorigenic after subcutaneous injection in nude mice when compared with the parental CHO-WT or RC^R-7 lines. This decreased tumorigenicity could be reversed by the i.v. injection of antiserum directed at the NK cell determinant asialo GM_1. In conclusion a $ConA^R$ tumor cell with a demonstrable oligosaccharide biosynthetic defect, exhibited enhanced NK lytic sensitivity and was poorly tumorigenic in vivo, a feature which may also be a consequence of its altered NK reactivity.

TISSUE SPECIFIC EXPRESSION OF THE NEWLY ACQUIRED ECOTROPIC Emv-18 PROVIRUS IN *Fv-2* CONGENIC MICE

Ian Robson, Michael Mowat, and Alan Bernstein

Expression of endogenous retroviral sequences in *Fv-2* congenic mouse strains was examined by Northern blot analysis. Endogenous ecotropic virus transcripts were observed in total spleen RNA of B6.S (*Fv-2*^{ss}) mice. Endogenous ecotropic transcripts were not detected in spleen RNA of C57BL/6, the *Fv-2*^{rr} congenic partner of B6.S, nor in spleens of the C57BL/10 (*Fv-2*^{rr}) and B10.C (*Fv-2*^{ss}) congenic strains. Mendelian segregation analysis revealed that only backcross mice segregating the newly acquired *Fv-2*-linked endogenous ecotropic provirus had endogenous ecotropic transcripts in spleen RNA. Examination of different tissues of B6.S mice showed that *Emv-18* transcription was highest in spleen and bone marrow, tissues in which *Fv-2* has been shown to function. These results support the conclusion that chromosomal location is an important factor controlling *Emv-18* expression in B6.S mice. We also report the presence in the spleen of a novel xenotropic virus transcript detectable only in B6.S mice.

A PERMEABILIZED CELL SYSTEM FOR STUDYING REGULATION OF ARYL HYDROCARBON HYDROXYLASE: NADPH AS RATE LIMITING FACTOR IN BENZO(A)PYRENE METABOLISM

I. J. Sadowski, J. A. Wright and L. G. Israels

The disadvantage of a whole cell system for studying the metabolism of xenobiotics is that some substrates and regulatory molecules do not readily cross the cell membrane. The present study describes a technique to permeabilize H-4-II-E rat hepatoma cells for the study of benzo(a)pyrene metabolism. NADPH is an essential cofactor in the in vitro microsomal metabolism of benzo(a)pyrene and has been shown by indirect measurement to be a rate limiting factor in mixed function oxidase activity in whole liver perfusion systems. The role of NADPH has not been directly demonstrated in an intact cell system. Using this permeabilized whole cell system it is possible to directly demonstrate that NADPH is rate limiting in the mixed function oxidation of benzo(a)pyrene.

A COMPARISON OF RIBONUCLEOTIDE REDUCTASE ACTIVITIES IN NORMAL HUMAN FIBROBLAST STRAINS WITH THEIR TRANSFORMED COUNTERPARTS

Aaron Y. Tagger and Jim A. Wright

The objective of this investigation was to examine the relationship between levels of ribonucleotide reductase activity and transformation of two human cell strains. Enzyme activity levels were elevated by 3.2- to 3.5 fold in transformed cells compared directly to the normal human fibroblast strains from which they were derived. There did not appear to be a general correlation between elevated ribonucleotide reductase and increased proliferation abilities as has been previously observed with some rodent tumor cell lines. In keeping with the rise in reductase activity, human transformed cells were relatively more resistant to the cytotoxic effects of hydroxyurea, an antitumor agent whose site of action is ribonucleotide reductase. This suggests that an important point to be considered during drug therapy aimed at the reductase, is the possibility of a greater sensitivity of normal compared to transformed cells due to differences in enzyme activity. The results of this investigation support the view that an increased ability to reduce ribonucleotides is an important step towards the development of a neoplastic program in human cells.

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LIBRARY

Donna Chornenki

It has been a year of change for the Manitoba Cancer Foundation Library. Miss Isobel Steedman, who had been the Librarian since the inception of the Library in 1963, retired after 36 years of service to the Foundation. Twenty-two years ago Miss Steedman took on the task of setting-up the Library. She brought together the Foundations many books and journals that had been housed in various departments. These materials were catalogued, shelved and became the well-laid base of todays Library. The Library has grown over these twenty-two years to become an essential resource for the clinicians and research personnel.

The Library continues to grow and to be well utilized. The holdings now consist of 3,088 books, 1913 bound journals and 104 current subscriptions. Index Medicus continues to be the chief source of accessing information, and the Medical Library Medline computer is used for more complete searches.

This year the system of cataloguing books was changed to the National Medical Classification. The new cataloguing should be completed in 1986. The National Medical Classification is the system used by most hospitals and the University Medical Library.

The Patient Information Library is also being expanded from patient information on neoplastic diseases and counselling to include contemporary books on fiction, poetry and hobby information. The expansion comes under way by a recent donation of 900 books from T. Eaton Company Limited. The British Wives Club of the Canadian Cancer Society continues to support this patient library, which first came about through their donations.

VOLUNTEER SERVICES

Judy Searle — Coordinator of Volunteers

Ella Adams
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Kay Ahoff
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Louise Baker
Judy Baltus
Paul Bergman
Audrey Bird
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Marion Burwash
Kay Cairns
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Gail Furdyk
Fanny Goldenberg
Jagdip Goraya
Bonnie Greig
Murray Greenfield
Hilda Gregg
Fred Hayward
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Mary Inkster
John Jack
Yasmin Jamal
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Florence Kristinson
Diane Laliberte
Garth LaPlante
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Emily Levitt
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Margaret Thompson
Ressa Tod
Daisy Tooth
Kimberly Weidermann
Myrtle Weir
Mary Wolfe
Lillian Young

The purpose of Volunteer Services is to enhance patient care; to supplement staff in the performance of non-professional duties to complement their work by providing additional services and comforts to patients and families; to promote good public relations and to ensure a positive growth experience for those assuming the role of volunteer at the Manitoba Cancer Treatment and Research Foundation.

The latter months of 1983 saw the establishment of the department infrastructure and the identification of volunteer needs at the Foundation. The recruitment of potential volunteers ensued. The main thrust of the publicity and advertising was conducted in January and February. Those radio and television stations which offered free public service announcements received a letter describing the Foundation and its volunteer program. The request for assistance was met very positively with the radio service proving the most successful. Together the two medias attracted about 80% of the prospective volunteers to the centre. Other volunteers came through the Volunteer Centre of Winnipeg, the Fine Option Program and from friends and family members of cancer patients attending the Foundation. It has been important to the success of the volunteer program to have open lines of communication with staff and ensure not only their understanding but their sense of ownership of the program.

Two orientation meetings were successfully conducted for Canadian Cancer Society volunteer drivers. The goal of this endeavour was to familiarize the drivers with the Foundation. The event also provided a link with C.C.S. volunteers. Meetings with Lounge Ladies and convenors to discuss program development and modification to meet the changing patient needs led to the design and distribution of a patient needs survey to gain feedback directly from the patients as to their views on existing volunteer programs and provide some direction in future planning of volunteer programs. The two-page questionnaire was distributed (in July) to patients and families in the waiting areas. One hundred and fifty-two (152) individuals responded to the survey. The results of the cancer patient needs survey offered direction for expanded and improved services by volunteers including emotional support, availability of books in lounges, more food service and finally the need for increasing awareness of volunteer programs.

A report submitted to Administration in December, 1983 on the CanSurmount Program and the feasibility of its revitalization at the Foundation led to its presentation to key Department Heads. One of the needs identified for Volunteer Services had been the identification of support volunteers. The drive to recruit CanSurmount for the Foundation was based on their record in meeting patient needs, and CanSurmount's well-developed training program. Therefore, after receiving approval to investigate the potential for this program at the Foundation, meetings were arranged with various staff in clinic and treatment areas. Working closely with the Provincial CanSurmount Coordinator has been most rewarding. There is mutual support and cooperation as both realize the need for this patient service. The support by staff is most encouraging but it was agreed that the CanSurmount Coordinator, staff, and Coordinator of Volunteers would move toward implementing the program. By the end of 1984 one CanSurmount visitor had been placed in the Gynecology Clinic and plans made for more Chemotherapy assignments as well as Radiotherapy Clinic placements.

At the St. Boniface Unit it was decided that the volunteer program be shared as a three-way responsibility with the Coordinator of Volunteers for St. Boniface Hospital and the St. Boniface CanSurmount Coordinator. Currently all five days are manned by CanSurmount trained volunteers. The need for additional volunteers and services will be assessed as required.

Volunteer Services welcomed the opportunity to be of assistance to the Board of Ronald McDonald House when they requested support for their opening gala "Showcase" and for possible involvement in the development of future volunteer programs.

National Volunteer Recognition Week, April 23-29, 1984 provided an opportunity to rally staff and volunteer support for programs in the facility. The distribution of buttons and posters, obtained through the Volunteer Centre, was well received. The Strawberry Tea assembled all those volunteers who relate to the Foundation. This inolved 160 volunteers from twelve programs including Foundation Volunteers, C.C.S. Drivers, Lounge Ladies, Breast Screening Hostesses, and Lennox Bell Lodge Volunteers. The Tea was planned to extend appreciation to volunteers and staff alike for their support and promotion of Volunteer Services. The eloquent speeches made by the C.C.S. President and the Chairman of the Board of the Foundation publicized the cooperative relationship between staff and volunteers; and volunteers and volunteers.

The United Way Campaign is a staff function but this year it was supplemented by two volunteers who co-chaired the public relations effort of the campaign. This involved making staff aware of the various facets of the United Way by using posters and display board as well as assisting in the organization of the campaign's "kick-off" tea. An added corps of five (5) volunteers provided back-up service at the kick-off event.

The Christmas Hamper Project topped off the year! This was the first year that Christmas Hampers for M.C.F. patients were organized and operated with the leadership and assistance of a volunteer. The Foundation provided hampers to all seventeen (17) patients and their families who were suggested by staff. There were many volunteers and staff who sorted, packed, gift wrapped, and delivered hampers. Additional contributors were: Transcona Optimist Club, Manitoba Paramedical Association, Modern Dairies Ltd., Lever Detergents, Hazelwood Davis Wholesalers and Family Fare, E.K. An abbreviated financial account states that cash received = $715.00 less expenditures = $524.03 leaves a balance of $190.97 to be kept in savings for future hamper projects or for use in patient emergency.

THE CANADIAN CANCER SOCIETY VOLUNTEERS PROGRAMS

The Canadian Cancer Society Patient Services offered at the Manitoba Cancer Treatment & Research Foundation continue to grow and diversify, resulting in increased numbers of patients obtaining assistance through the dedicated commitment of many volunteers.

Canadian Cancer Society Lounge:

The Lounge opened on May 23, 1963. At that time, it served approximately 1000 refreshments per month. Today, btween 3500 and 4000 refreshments are distributed monthly.

Volunteer Drivers:

This program, established to assist patients with transportation difficulties, has rapidly grown and has been greatly enhanced by Masonic involvement. This quality program, which recently received an award from the Mayor, supplies between 550 and 650 rides per month.

Wig Service:

Each month, this well-utilized service provides between 30 and 40 restored wigs, as well as numerous head scarves to cancer patients. A second service has now been established at the St. Boniface Hospital.

CanSurmount:

The "We've Been There" visitors are on-site in several of the treatment areas. Under the capable leadership of the new Convenor, George Ackerman, these volunteers visit informally with cancer patients as well as provide one-to-one visits.

Lennox Bell Lodge:

On-site volunteers welcome rural patients and family members and endeavour to provide a "Home away from Home".

Financial Assistance:

According to the philosophy of the assessment program, which states that "no patient miss the opportunity for treatment due to financial need", between 10 and 20 patients receive help each month.

EPIDEMIOLOGY AND BIOSTATISTICS

DIRECTOR — N. W. Choi, M.D., M.P.H., Ph.D., F.A.P.H.A., F.A.C.E.
BIOSTATISTICIAN — N. A. Nelson, B.A., M.A., Ph.D.; P. F. Moodie, B.Sc. Hons., M.Sc.

SECRETARY

M.-P. Regan

FIELD INVESTIGATORS

M. Conway, K. Hjalmarsson, J. Du, C. Gillon

DATA PROCESSING

M.-P. Regan

Introduction

Epidemiology is the study of the distribution and determinant of health-related states and events in populations, and the application of the study results to control of health problems.

The studies that have been conducted in the department range from descriptive and analytical epidemiological studies to evaluation and statistical studies.

Significant aspects of our research this year have continuously been in the various issues of "iatrogenic diseases" and natural and industrial environment associated with human cancers.

The following report outlines the progress of the on-going projects and briefly describes the nature of the new studies.

A STUDY OF THE RELATIONSHIP, OF VITAMIN K ADMINISTRATION TO NEWBORNS AND INCREASED RISK OF CANCER IN CHILDREN

N. W. Choi, K. Hjalmarsson, N. A. Nelsen, L. G. Israels

We have designed a case-control study to examine if vitamin K administration at or shortly after birth increases the risk of cancer in children. This project has been progressing well and we are in the last phase of compiling information before analyzing our data. The results should prove interesting, inasmuch as such an association has been reported in laboratory studies.

PILOT STUDY OF LUNG CANCER AND DOMESTIC ENVIRONMENT

N. W. Choi, M. Conway, J. Du, Catherine Gillon

In conjunction with the National Cancer Institute of Canada, Manitoba is involved in a pilot case-control study of lung cancer incidence in Winnipeg. We are interviewing 100 cases of recently diagnosed lung cancer and 100 controls.

An important revelation over the past few years has been the discovery of elevated levels of the radioactive gas radon and its disintegration products in Canadian homes. The decay products of radon known as radon daughters are carcinogenic. The elevated levels found in some Canadian homes may be approaching those in mines and may be significant with respect to public health.

A questionnaire was prepared to obtain the data that we seek at these 200 addresses on the individual and personal history and occupation of the patient/control and the family working habits for the last 25 years. Included will be information on the type of dwelling and measurement of radiation level. Permission will be required from the case-control subjects to place and recover a radon integrating sampler and the period of measurement will be six months.

EVALUATION OF CERVICAL CANCER SCREENING PROGRAMMES — AN INTERNATIONAL COLLABORATIVE STUDY

N. W. Choi, N. A. Nelson, M. Regan, in collaboration with the International Agency for Research on Cancer.

Manitoba has participated in an international collaborative study, organized by the International Agency for Research on Cancer, on the evaluation of invasive cervical cancer incidence reduction due to a mass cervical cytology screening program.

The person-years at risk for the 335,220 women who entered Manitoba province-wide cervical cytology screening program with a negative Pap smear have been tabulated and 83 squamous cell invasive cervical cancer cases have been identified among them. The beginning year for the study was 1963 when the cytology registry was officially begun and the closing date was December 31, 1974. During that time, 2,033,419 person-years of risk were experienced (average of 6.1 years per woman). These person-years of risk were broken down into age categories, years since last negative screen and number of previous negative screens when the person-years were experienced. From this breakdown, one observes that of the person-years at risk experienced before age 65, 87% were experienced before age 55. In addition 48% were experienced after the first negative screen and before any subsequent screens. Of the 52% after two or more negative screens, 95% were experienced within 5 years from the last negative screen. Thus, a large part of the risk experience is among younger women with time intervals less than five years. There were 72 squamous cell invasive cervical cancer cases which occurred among these women before they reached age 65 and without becoming positive previously through screening.

A positive screening status was defined as the detection of atypia on three or more consecutive screens, atypia on two consecutive screens at least 10 months apart or a class three atypia or tumour.

As the time interval gets longer, there is a greater chance of an in situ tumor converting to an invasive case. It would then seem to be of the greatest interest to investigate those ages where the in situ incidence is highest (<age 55), those time intervals (0-5) where the bulk of our person-years of risk lie and the experience after 2 or more negative screens which reduces the effect of false negatives.

The percentages of person-years, based on the total person-years for the ages represented, are given in the table along with the observed invasive cervical cancer cases per 100,000 person years (ages 35-44 and 45-54 have similar distributions of person years by time interval). The numbers of cases here are very small. However, an increasing trend in incidence with longer time intervals is indicated and the total post screening incidence is approximately 10% of Manitoba's total rate.

More definitive results exist for the collaborative study which involves ten centres.

INCIDENCE OF SQUAMOUS CELL INVASIVE CERVICAL CANCER
BY AGE AND TIME SINCE PREVIOUS NEGATIVE SMEAR
(Among women who had two or more previous negative smears)

	<35			35-54		
Time Int. (Years)	Person-years % of Age Total	O*	Inc. 100,000	Person-years % of Age Total	O	Inc. 100,000
< 1	58.6	2	0.8	49.9	8	3.5
1-2	21.8	3	3.4	22.8	2	1.9
2-3	8.7	2	5.6	10.5	1	2.1
3-4	4.7	2	10.4	6.2	2	7.1
4-5	2.8	2	17.7	4.0	1	5.5
Total	**96.6**	**11**	**2.8**	**93.4**	**14**	**3.3**

*Observed squamous cell invasive cervical cancer cases.

EPIDEMIOLOGY STUDY OF DIET AND PANCREATIC CANCER

N. W. Choi, M. Conway, N. A. Nelson in collaboration with the I.A.R.C., France.

Pancreatic carcinoma is relatively common in Western countries including Canada and a number of factors have been associated with this cancer but none has been singled out. After completing our pilot case-control study, we embarked on a definitive study and it is progressing satisfactorily. In this definitive study which followed a pilot study in the past year, we have introduced a modified diet and lifestyle questionnaire that permits us to interview proxies. Data collection has been progressing well and this is a part of the collaborative study with other centres around the world. The IARC programme on the Surveillance of Environmental Aspects Related to Cancer in Humans (SEARCH) was undertaken in a few developed and developing areas of the world including our centre and the first cancer sites to be investigated are pancreas, bile duct and gallbladder.

INTERNATIONAL COLLABORATIVE STUDY ON MALIGNANT MELANOMA

N. W. Choi, J. Ediger, B. Wingert, M. Regan in collaboration with the IARC, France.

The purpose of this international collaborative study is primarily to investigate true tends of malignant melanomas by age, sex, sub-site, histological type. Like many parts of the world, Manitoba has experienced an increasing trend in this type of cancer over the decades. The trend may be due partly to changing criteria and/or to the increased risks in certain sub-sites of the body. A comprehensive documentation of descriptive data from the registry including pathological data has been completed. The data from the Province of Manitoba have been sent to IARC in France to be included with the data from other countries participating in this study and collective analysis of the data so contributed is in its final stage.

INTERNATIONAL STUDY ON RADIATION EFFECTS ON SECOND PRIMARY CANCERS

N. W. Choi in collaboration with the IARC and the NCI.

This is a multinational collaborative study to investigate if there are increase risks of having second primary cancers among the patients with cervical cancer who were treated with radiation.

We have now gathered the information required from Manitoba. This data will be added to the information received from other countries participating in this collaborative study.

A report of the findings should be available in 1985.

SURVEILLANCE OF ENVIRONMENTAL ASPECTS RELATED TO CANCER IN HUMAN (SEARCH) — BRAIN TUMORS AMONG CHILDREN

N. W. Choi, N. A. Nelson in collaboration with the IARC, France

This project is also in the SEARCH group and involves interested epidemiologists from around the world. Priorities were discussed and recommendations were made as to the feasibility of this collaborative research. The goals of this endeavour are to:

1. Evaluate the role of certain compounds such as N-Nitroso and classes of exposure to be assessed which include diet, drinking water, drugs, vitamins, cosmetics, etc.
2. Quantify the impact of certain well known etiologic factors: radiation and specific genetic syndromes.
3. Explore the relation between brain tumour incidence and a variety of other personal characteristics and exogenous exposures.

In order to carry out these objectives, at the October meeting, the initial collaborators including the director of this department, have constructed a common protocol. The collaborating centres will soon undertake population-based case-control studies of newly occurring brain tumours among children.

THE EFFECT OF CHEMOTHERAPY ON SITES SUCH AS OVARY, TESTIS, AND HODGKIN'S AS IT RELATES TO SECOND PRIMARY CANCER

N. W. Choi in collaboration with the IARC, France

In this collaborative study involving many centres, we will be looking at the effect in any of chemotherapy for cancers of the ovary, testis and Hodgkin's disease on subsequent primaries. Of particular interest are lung, bladder and leukemia.

A cohort study involving 1835, 457, and 787 cases with ovary, testis and Hodgkin's cancers respectively occurring during 1950 to 1983 in Manitoba was carried out. A total number of 171 second primary cases were found. Analysis of the cohort study is being made. Also a case-control study involving 14 lung, 8 bladder and 4 leukemia cases as second primaries will be conducted for indepth analysis of the effects of chemotherapeutic agents on second primaries.

MAPPING OF CANCER INCIDENCE IN MANITOBA BY GEOGRAPHIC LOCALE

N. W. Choi, N. A. Nelson, M. Regan, B. Wingert

Cancer incidence cases for the time periods 1965-69, 1970-74 and 1975-79 have been tabulated for the 20 census divisions which were in effect prior to 1982. These tabulations were further broken down by cancer site, sex and age. Manitoba incidence rates from tables found in *Cancer Incidence on Five Continents* were applied to the appropriate populations for the tables to obtain expected numbers of cases to compare with the observed cases. Exponential interpolation was used to obtain population estimates for the midpoint years 1967, 1972 and 1977.

Each census division was compared to Division 20 (Metro Winnipeg). Relative risks were obtained with the ratio of the observed number of cases divided by the expected number of cases. Winnipeg's risk was close to that of the rest of Manitoba (relative risk <1.10) for all sites combined during the time periods 1970-74 and 1975-79.

This small amount over 1.00 may be due to biases. This bias can come about through selective migration by people who are not well, by the fact that addresses given do not precisely tell where the patient has been living and possibly by differences in the completeness of case ascertainment. One may find such bias more in some sites than in others. Random variation in incidence must also be taken into account when one examines the relative risk. However, for the years 1970-79, Winnipeg's incidence of lung cancer does appear to be higher than for the rest of Manitoba (statistically significant $p<.05$ — relative risk is 1.27 for males and 1.42 for females).* Towns and cities with populations over 2500, and rural municipalities are also being studied. The biases consistently cause towns and smaller cities to appear to have higher risk.

*Such an "all areas investigated" approach gives a more correct set of probability statements than an "after the fact" selection of a particular area which experienced an excess of cases.

BIOMETRY PROJECTS

N. A. Nelson, P. F. Moodie

The biometricians assumed the responsiblity of teaching the biostatistics course in the Department of Social and Preventive Medicine, Faculty of Medicine during the 1983-84 term, and have given statistical consultation to other researchers. Computer programs have been developed for special tasks in epidemiological research (e.g. sampling, follow-up years at risk for subgroups and expected cases and survival analysis). A current project of considerable interest involves a projection of radiotherapy machine usage. The projection methodology may be used in other studies. Though sampling difficulties were encountered, the sampling and abstracting of information by the cancer registry has been completed and preliminary tables have been constructed. The analysis procedures will be carried out using the SAS statistical package. A considerable gain in the efficiency of these endeavours will be realized through the acquisition of the SAS package for the computer in the Foundation and a microcomputer for the epidemiology and biostatistics department.

A large simulation study has also been carried out through the use of SAS statistical package and the results have been submitted for publication.

PUBLICATIONS

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Boice, J. D., Day, N. E., Andersen, A., Brinton, L. A., Brown, P., Choi, N. W., Nelson, N. A. et al. Cancer Risk Following Radiotherapy of Cervical Cancer: A Preliminary Report. Radiation Carcinogenesis: Epidemiology and Biological Significance, edited by J. D. Boice and J. F. Fraumeni Jr., Raven Press, New York, 1984.

Boice, J. D., Day, N. E., Choi, N. W., Nelson, N. A. et al. Second Cancers Following Radiation Treatment for Cervical Cancer. An International Collaboration between Cancer Registries. J.N.C.I. in press, 1984.

Choi, N. W., Moodie, P. F., Nelson, N. A. Epidemiology and Natural History of Cerebral Tumours in Childhood in Manitoba. Xth Scientific Meeting of the International Epidemiological Association, p. 374, Vancouver, 1984 (Abstract).

Choi, N. W. Cancer of the Cervix — A consequence of sexually transmitted diseases. XI International Congress for Tropical Medicine and Malaria, Calgary, 1984 (Abstract).

Choi, et al. Eighth International Meeting of N-Nitroso Compounds Occurrence, Biological Effects and Relevance to Human Cancer. Cancer Research 44, pp. 1301-1304, March 1984, (Meeting Report).

Moodie, P. F., Nelson, N. A. Application of a Multivariate Analysis of Variance: A nested design. Presented at the Spring 1984 Meeting of the Biometric Society (ENAR), (Abstract).

Moodie, P. F. and Craig, D. B. Experimental Design and Statistical Analysis. Editorial, Canadian Anaesthetists' Society Journal. (Submitted for publication).

Moodie, P. F., Harvey, A. C.: Portable Diagnostic System for Acute Abdominal Pain. In Proceedings of the Sixth International Symposium on Circumpolar Health, 1984 (Abstract).

Nelson, N. A., Moodie, P. F. A Robust Test for Homoscedasticity of Covariance Matrices. J. Am. Statistical Association. (Submitted for publication).

Risch, H. A., Jain, M., Choi, N. W. et al. Dietary Factors and the Incidence of Cancer of the Stomach. Accepted for publication by the Am. J. of Epidemiology, 1984.

Risch, H. A., Jain, M., Choi, N. W. et al. Nitrate and Ascorbate in a Study of Gastric Cancer, Xth Scientific Meeting of the International Epidemiological Association, p. 134, Vancouver 1984 (Abstract).

ONCOLOGY RECORDS AND REGISTRY

Director — H. Schipper, B.A.Sc., MD, FRCP(C) from June 01, 1984.
Manager — J. Ediger, H.R.A.

SENIOR STAFF

Senior Medical Records Technician — W. Wingert, H.R.T.
Senior Dictatypist — A. Nelson
Senior Clerk-Typist — C. Belanger

MEDICAL RECORDS TECHNICIANS

K. Hjalmarsson, H.R.T.; C. Karaz, H.R.T.; G. Walsh, H.R.T.; E. Tower, H.R.T.; J. Walker, H.R.T.; J. Meikle; M. Storey, H.R.T.

DICTATYPISTS

V. Nordal, D. Meakin, L. Pauls, F. Blais

SUPPORT STAFF

R. Bresch, A. Cookson, C. Johnson, K. Friesen, K. Whalen, R. Zaroda, M. Corden, M. Cabral, C. MacLean, L. Hjalmarsson, G. Haufschild, M. Varkerti, G. Aquin, A. Friedle, J. Redden

DATA PROCESSING DEVELOPMENT AND SUPPORT

Programmer/Analyst — B. Wingert
Programmer — K. Kehler
Datas Entry — D. Zimmer
Computer Science Students — Richard Cuthbert, Katherine Stewart

ST. BONIFACE SECTION

Senior Dictatypist — L. Soshycki
Medical Records Technician — L. Gilmore
Dictatypist — A. Werbicki
Support Staf — C. Kohler, N. Johnson

The Cancer Registry was established under the Manitoba Public Health Act in 1937, and has been population based since 1951. It is now internally computerized, and the Registry function has been merged with the treatment record for those persons receiving treatment at the Foundation.

These records amount to an almost unique data base. The department is in the midst of a physical and philosophic reorientation to augment and exploit its research potential.

(A) A Records and Registry Research Advisory Committee has established the following policies governing research activities:

1. Projects must be approved by the Director, with the advice of the Records & Registry Research Advisory Committee according to the following criteria:
   i. The goals of the Cancer Registry.
   ii. The adequacy of research design.
   iii. Personnel, computer and other demands.
   iv. Current operational demand.
2. Projects may be of three types
   i. *Operational:* Necessary to the day to day function of the Manitoba Cancer Treatment and Research Foundation, eg. site reviews, radiotherapy utilization studies etc. These may be undertaken only by MCF staff in their fields of expertise.

   ii. *Research:* Open to all qualified researchers. Must be approved by the Ethics Committee, U. of M. Any appropriate utilization of the resource is encouraged. In particular natural history, epidemiology and econometric studies are encouraged. Clinical studies may also be reviewed by the Protocol Review Committee of the Foundation.

   iii. *Computer applications:* The computer resource is available to MCF personnel for analytic, process control and other applications as may be deemed feasible from time to time by the participants.
3. Pilot projects and feasibility studies are encouraged and may be supported by Records & Registry staff as resources permit.
4. All projects must be reviewed by the Records & Registry staff for statistical and computational feasibility *prior* to review by the Director. Applicants should view this process as consultative, intended to minimize effort, and maximize utilization of the resource.
5. For all projects *strict* confidentiality must be assured at all times. All persons accessing the registry will be required to sign an oath of confidentiality.
6. While the primary objective of Records and Registry review is to assure efficient and proper use of the Registry and confidentiality, research proposals which have not been externally funded and/or have not undergone independent peer review, may also be examined as to scientific merit. Clearly, projects involving extensive staff and resource committments will be closely reviewed.
7. All projects will be priorized by the Director. The operational requirements of the registry will always take precedence over research activity and may, from time to time, occupy all available resources. Staff will attempt to schedule research projects

so as to minimize such inconveniences to the investigators. Priorization guidelines will include:

1. Size of staff and computer requirements.
2. Scientific merit as it relates to the goals of the Registry.
3. Project deadline.
4. Funding status of the project.

8. Projects of type (ii) and (iii), Item 2, will be charged for resource utilization at rates to be established from time to time. These charges may include
   - i. statistical consultation time
   - ii. programming and programming assistance
   - iii. computer utilization time
   - iv. medical records staff time
   - v. consumables, telephone charges etc.
9. The data remain the property of the MCF, and users must acknowledge the Registry in publications and presentations.
10. Researchers who require consultation will be encouraged to use the Manitoba Cancer Foundation resource for data analysis to maximize utilization of the experience and expertise of Manitoba Cancer Foundation staff.
11. MCF Records and Registry will assume no responsibility for the accuracy of data reported by investigators using the Registry, or for any interpretations thereof.
12. Researchers must agree to submit to the Director all papers and reports for publication for review prior to distribution or publication to assure that the anonymity of respondents is preserved and that any reference to the Registry is factually correct.

(B) The computer facility has been upgraded to provide in house statistical services using SAS, as well as greater memory and data storage space.

(C) A co-operative relationship with the Department of Computer Science at the University of Manitoba has been established. Professor Mathias Laucht has been appointed Adjunct Professor and among other roles co-ordinates co-op students in a range of Foundation based computer programs.

(D) In anticipation of the expansion of the Cancer Foundation Outreach Program to serve the entire Province, a software/hardware development group has identified a hardware configuration to serve the entire province, has largely completed software specifications and has begun coding. The program is expected to be implemented in stages beginning in 1985.

CANCER INCIDENCE AND MORTALITY IN THE PROVINCE OF MANITOBA DURING THE CALENDAR YEAR 1984

The following self-explanatory tables and figures will illustrate the extent of morbidity of and mortality from cancer. Tables I to VI and Figure 1 refer to the former. Tables VII to X and Figure 2 to the latter.

TABLE I

INCIDENCE — PLACE OF DIAGNOSIS 1984

Source	Male	Female	Total
Health Sciences Centre	481	426	907
St. Boniface General Hospital	421	444	865
Other Hospitals in Greater Winnipeg	916	802	1,718
Other Hospitals in Manitoba	629	622	1,251
Hospitals Outside Manitoba	32	49	81
Doctors and Clinics	345	493	838
Total	**2,824**	**2,836**	**5,660**

TABLE II

INCIDENCE — RESIDENCE OF NEW CANCER PRIMARIES 1984

Residence	Male	Female	Total
Greater Winnipeg	1,462	1,604	3,066
Manitoba — Outside Greater Winnipeg	1,262	1,107	2,369
Non-Manitoba Residence	82	108	190
Residence Unknown	18	17	35
Total	**2,824**	**2,836**	**5,660**

TABLE II A

INCIDENCE — RESIDENTIAL DISTRIBUTION OF NEW CANCER PRIMARIES 1984

Residence	Male	Rate	Female	Rate	Total	Rate
Division 1	56	666.2	32	410.7	88	543.3
Division	73	380.2	58	314.1	131	347.8
Division 3	118	643.4	91	492.2	209	567.5
Division 4	55	914.3	32	561.4	87	742.6
Division 5	55	640.6	60	712.1	115	676.0
Division 6	38	701.1	29	540.0	67	620.9
Division 7	192	723.1	196	703.0	388	712.8
Division 8	46	602.8	46	638.4	92	620.1
Division 9	63	537.0	61	518.7	124	527.8
Division 10	10	272.4	8	239.8	18	256.9
Greater Winnipeg	1,467	539.5	1,612	550.9	3,079	545.4
Division 12	39	511.4	31	432.0	70	472.9
Division 13	47	298.6	65	423.4	112	360.2
Division 14	27	376.8	26	396.3	53	386.1
Division 15	123	979.2	101	829.5	224	905.5
Division 16	35	605.5	19	342.0	54	476.4
Division 17	93	656.0	75	538.0	168	597.5
Division 18	76	677.3	59	558.7	135	619.8
Division 19	7	109.1	3	51.3	10	81.5
Division 20	34	528.7	23	374.5	57	453.4
Division 21	43	337.5	51	425.8	94	380.3
Division 22	17	122.2	27	211.4	44	164.9
Division 23	10	188.3	6	127.7	16	159.9
Total	**2,724**	**537.7**	**2,711**	**532.8**	**5,435**	**535.2**

Based on Statistics Canada 1981 Census Data

TABLE III

INCIDENCE — METHOD OF DIAGNOSIS — PERCENT DISTRIBUTION BY SITE 1984

ICDA 9TH REV.		Histo-Logical	Cyto-Logical	Radio-Logical	Autopsy Only	Clinical*
140-149	**Buccal Cavity and Pharnyx**	89.6	4.2	4.8	0.0	1.2
150-159	**Digestive Organs**					
	Oesophagus	69.6	6.0	18.1	3.0	3.0
	Stomach	74.5	4.9	12.2	3.2	4.9
	Small Intestines	77.7	0.0	11.1	11.1	0.0
	Large Intestines (including Rectum and Peritoneum)	81.5	0.8	14.5	0.6	2.4
	Liver, Pancreas and Biliary Passages	38.9	13.7	31.1	4.1	11.9
	Total	**72.6**	**3.8**	**17.2**	**1.8**	**4.4**
160-165	**Respiratory System**	28.1	23.2	44.8	1.9	1.7
	Breast and Genito-Urinary System					
174, 175, 179-189, 233.1	Breast	78.4	6.4	13.0	0.5	1.6
236.1	Female Genital Organs	65.9	28.7	3.9	0.1	1.1
	Male Genital Organs	86.6	4.7	4.5	1.3	2.7
	Urinary Organs	66.1	11.5	19.9	1.9	0.3
	Total	**74.6**	**13.9**	**8.9**	**0.8**	**1.5**
170-173	**Other and Unspecified Sites**					
190-199	Bones and Connective Tissue	87.0	0.0	12.9	0.0	0.0
	Skin — Melanoma	96.9	0.0	1.5	0.0	1.5
	Skin — Other Malignancies	99.7	0.0	0.0	0.0	0.2
	Eye	92.8	0.0	7.1	0.0	0.0
	Brain and Nervous System	13.7	0.0	80.3	1.9	3.9
	Thyroid and Endocrine Glands	62.5	12.5	22.5	2.5	0.0
	Other and Unspecified Sites	39.3	16.5	36.5	1.3	6.2
	Total	**89.2**	**1.9**	**7.4**	**0.2**	**1.0**
200-208	**Lymphatic and Hematopoietic**					
	Recticulum Cell Sarcoma and Lymphosarcoma	72.2	12.8	13.8	0.9	0.0
	Hodgkins Disease	95.0	0.0	5.0	0.0	0.0
	Other Lymphomas	64.1	15.0	13.2	3.7	3.7
	Multiple Myeloma	26.1	45.2	23.8	0.0	4.7
	Leukemia	23.7	63.9	1.0	3.0	8.2
238.4	Polycythemia Vera	9.0	18.1	0.0	0.0	72.7
289.8	Myelofibrosis	54.5	36.3	0.0	0.0	9.0
	Total	**49.8**	**32.2**	**9.8**	**1.7**	**6.2**
	Total — All Sites	**71.3**	**10.9**	**14.3**	**1.0**	**2.2**

*including 14 laporotomy without biopsy

TABLE IV

INCIDENCE — AGE AND SEX DISTRIBUTION OF NEW CANCER PRIMARIES 1984

Age Group	Male	Rate	Female	Rate	Total	Rate
0-4	11	26.5	8	20.5	19	23.6
5-9	5	12.5	1	2.6	6	7.7
10-14	5	12.1	2	5.0	7	8.6
15-19	5	11.3	17	40.0	22	25.4
20-24	9	17.8	47	95.3	56	56.2
25-29	18	39.2	117	256.0	135	147.3
30-34	28	67.7	110	264.4	138	166.4
35-39	31	84.9	98	269.9	129	177.1
40-44	55	192.9	100	353.3	155	272.8
45-49	77	314.2	123	504.0	200	408.9
50-54	141	575.5	177	716.5	318	646.3
55-59	242	1,008.3	228	887.1	470	945.6
60-64	360	1,558.4	300	1,127.8	660	1,327.9
65-69	411	2,118.5	304	1,363.2	715	1,714.6
70-74	491	3.088.0	366	1,886.5	857	2,427.7
75-79	406	3,903.8	264	1,833.3	670	2,701.6
80-84	245	3,888.8	222	2,387.0	467	2,993.5
85-89	110	4,074.0	148	2,846.1	258	3,265.8
90 and over	70	5,384.6	74	2,466.6	144	3,348.8
Unknown	4	0.0	5	0.0	9	0.0
Total	**2,724**	**522.3**	**2,711**	**506.7**	**5,435**	**514.4**

TABLE V A

INCIDENCE

AGE AND SEX DISTRIBUTION — BUCCAL CAVITY AND PHARYNX 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	3	1.1	3	1.1	6	1.1
30-39	6	7.7	4	3.8	10	5.7
40-49	9	16.9	3	5.6	12	11.3
50-59	22	41.2	7	11.9	29	26.2
60-69	37	84.7	6	12.2	43	45.9
70-79	30	114.0	10	26.6	40	64.8
80-89	16	166.6	6	34.4	22	85.1
90 and over	1	76.9	1	33.3	2	46.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**124**	**23.0**	**40**	**6.7**	**164**	**14.7**
(ii) Lip						
Under 30	1	0.3	0	0.0	1	0.1
30-39	3	3.8	2	2.5	5	3.2
40-49	5	9.4	1	1.8	6	5.6
50-59	9	16.4	4	5.9	13	11.1
60-69	15	35.2	0	0.0	15	16.4
70-79	22	83.6	4	8.8	26	41.5
80-89	6	55.5	3	13.7	9	29.7
90 and over	1	76.9	0	0.0	1	23.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	**62**	**11.5**	**14**	**2.0**	**76**	**6.7**

TABLE V B

INCIDENCE

AGE AND SEX DISTRIBUTION — DIGESTIVE SYSTEM 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	2	0.7	5	1.9	7	1.3
30-39	11	14.1	8	10.2	19	12.2
40-49	21	39.6	12	22.7	33	31.2
50-59	78	160.8	55	109.1	133	134.4
60-69	141	331.7	96	192.2	237	257.1
70-79	183	695.8	141	417.1	324	539.1
80-89	77	855.5	84	579.3	161	685.1
90 and over	13	1,000.0	21	700.0	34	790.6
Age not stated	0	0.0	0	0.0	0	0.0
Total	**526**	**100.8**	**422**	**78.5**	**948**	**89.5**

TABLE V B (CONT'D)

	Male	Rate	Female	Rate	Total	Rate
(ii) Oesophagus						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	0	0.0	1	0.6
40-49	1	1.8	0	0.0	1	0.9
50-59	2	4.1	2	3.9	4	4.0
60-69	5	11.7	5	10.2	10	10.9
70-79	9	34.2	5	14.7	14	23.2
80-89	1	11.1	2	13.7	3	12.7
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**19**	**3.6**	**14**	**2.6**	**33**	**3.1**
(iii) Stomach						
Under 30	0	0.0	1	0.3	1	0.1
30-39	1	1.2	1	1.2	2	1.2
40-49	2	3.7	1	1.8	3	2.8
50-59	9	18.5	5	9.9	14	14.1
60-69	17	40.0	11	22.4	28	30.6
70-79	34	129.2	13	38.4	47	78.2
80-89	14	155.5	9	62.0	23	97.8
90 and over	2	153.8	2	66.6	4	93.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**79**	**15.1**	**43**	**8.0**	**122**	**11.5**
(iv) Large Intestine						
Under 30	0	0.0	4	1.5	4	0.7
30-39	3	3.8	6	7.7	9	5.7
40-49	9	16.9	7	13.2	16	15.1
50-59	29	59.7	36	71.4	65	65.7
60-69	54	127.0	39	79.7	93	101.7
70-79	66	250.9	61	180.4	127	211.3
80-89	31	344.4	49	337.9	80	340.4
90 and over	5	384.6	14	466.6	19	441.8
Age not stated	0	0.0	0	0.0	0	0.0
Total	**197**	**37.7**	**216**	**40.3**	**413**	**39.0**

TABLE V B (CONT'D)

	Male	Rate	Female	Rate	Total	Rate
(v) Rectum and Rectosigmoid Junction						
Under 30	1	0.3	0	0.0	1	0.1
30-39	4	5.1	0	0.0	4	2.5
40-49	5	9.4	3	5.6	8	7.5
50-59	18	37.1	8	15.8	26	26.2
60-69	40	94.1	18	36.8	58	63.4
70-79	37	140.6	29	85.7	66	109.8
80-89	18	200.0	14	96.5	32	136.1
90 and over	3	230.7	1	33.3	4	93.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	126	24.1	73	13.6	199	18.8
(vi) Liver and Biliary Passages						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	0	0.0	1	0.6
40-49	0	0.0	0	0.0	0	0.0
50-59	4	8.2	1	1.9	5	5.0
60-69	7	16.4	7	14.3	14	15.3
70-79	9	34.2	13	38.4	22	36.6
80-89	5	55.5	1	6.8	6	25.5
90 and over	2	153.8	2	66.6	4	93.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	28	5.3	24	4.4	52	4.9
(vii) Pancreas						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	0	0.0	1	0.6
40-49	4	7.5	1	1.8	5	4.7
50-59	16	32.9	3	5.9	19	19.2
60-69	14	32.9	12	24.5	26	28.4
70-79	27	102.6	17	50.2	44	73.2
80-89	8	88.8	9	62.0	17	72.3
90 and over	1	76.9	2	66.6	3	69.7
Age not stated	0	0.0	0	0.0	0	0.0
Total	71	13.6	44	8.2	115	10.8

TABLE V C

INCIDENCE — AGE AND SEX DISTRIBUTION — RESPIRATORY SYSTEM 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	1	0.3	0	0.0	1	0.1
30-39	4	5.1	2	2.5	6	3.8
40-49	17	32.0	10	18.9	27	25.5
50-59	95	195.8	41	81.3	136	137.5
60-69	166	390.5	60	122.6	226	247.2
70-79	155	589.3	53	156.8	208	346.0
80-89	41	455.5	23	158.6	64	272.3
90 and over	4	307.6	2	66.6	6	139.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	483	92.6	191	35.7	674	63.7
(ii) Larynx						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	0	0.0	1	0.6
40-49	2	3.7	0	0.0	2	1.8
50-59	9	18.5	1	1.9	10	10.1
60-69	17	40.0	3	6.1	20	21.8
70-79	6	22.8	2	5.9	8	13.3
80-89	2	22.2	0	0.0	2	8.5
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	37	7.0	6	1.1	43	4.0
(iii) Trachea, Bronchus, and Lung						
Under 30	1	0.3	0	0.0	1	0.1
30-39	3	3.8	2	2.5	5	3.2
40-49	13	24.5	10	18.9	23	21.7
50-59	84	173.1	40	79.3	124	125.3
60-69	146	343.5	56	114.5	202	221.0
70-79	147	558.9	51	150.8	198	329.4
80-89	38	422.2	21	144.8	59	251.0
90 and over	3	230.7	2	66.6	5	116.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	435	83.4	182	34.0	617	58.4

TABLE V D

INCIDENCE — AGE AND SEX DISTRIBUTION — BREAST 1984

	Male	Rate	Female	Rate	Total	Rate
Under 30	0	0.0	4	1.5	**4**	**0.7**
30-39	0	0.0	30	38.5	**30**	**19.2**
40-49	0	0.0	77	146.1	**77**	**72.8**
50-59	0	0.0	109	216.2	**109**	**110.2**
60-69	0	0.0	143	292.4	**143**	**156.4**
70-79	4	15.2	135	399.4	**139**	**231.2**
80-89	1	11.1	53	365.5	**54**	**229.7**
90 and over	0	0.0	5	166.6	**5**	**116.2**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**5**	**0.9**	**556**	**103.9**	**561**	**53.0**

TABLE V E

INCIDENCE — AGE DISTRIBUTION — FEMALE GENITAL ORGANS 1984

	Female	Rate		Female	Rate
(i) All organs			**(ii) Cervix Uteri**		
Under 30	146	56.3	Under 30	136	53.2
30-39	132	163.0	30-39	117	150.1
40-49	68	127.1	40-49	46	87.2
50-59	68	134.9	50-59	26	51.5
60-69	97	192.2	60-69	17	34.7
70-79	78	227.8	70-79	10	29.5
80-89	30	193.1	80-89	8	55.1
90 and over	2	66.6	90 and over	0	0.0
Age not stated	0	0.0	Age not stated	0	0.0
Total	**621**	**113.2**	**Total**	**360**	**67.1**
(iii) Uterus-Corpus etc. (Except Cervix)			**(iv) Ovaries, Fallopian Tubes, Broad Ligaments and other Genital Organs**		
Under 30	0	0.0	Under 30	8	3.1
30-39	0	0.0	30-39	9	11.5
40-49	12	22.7	40-49	9	17.0
50-59	28	55.5	50-59	14	27.7
60-69	52	106.3	60-69	25	51.1
70-79	38	112.4	70-79	30	85.7
80-89	11	75.8	80-89	9	62.0
90 and over	0	0.0	90 and over	2	66.6
Age not stated	0	0.0	Age not stated	0	0.0
Total	**141**	**26.3**	**Total**	**106**	**19.6**

TABLE V F

INCIDENCE — AGE DISTRIBUTION — MALE GENITAL ORGANS 1984

	Male	Rate		Male	Rate
(i) All Organs			**(ii) Prostate**		
Under 30	5	1.9	Under 30	0	0.0
30-39	8	10.2	30-39	1	1.2
40-49	3	5.6	40-49	1	1.8
50-59	28	57.7	50-59	25	51.5
60-69	116	272.9	60-69	114	268.2
70-79	187	711.0	70-79	184	699.6
80-89	77	855.5	80-89	77	855.5
90 and over	18	1,384.6	90 and over	18	1,384.6
Age not stated	0	0.0	Age not stated	0	0.0
Total	**442**	**84.7**	**Total**	**420**	**80.5**
(iii) Other Male Genital Organs					
Under 30	5	1.9			
30-39	7	8.9			
40-49	2	3.7			
50-59	3	6.1			
60-69	2	4.7			
70-79	3	11.4			
80-89	0	0.0			
90 and over	0	0.0			
Age not stated	0	0.0			
Total	**22**	**4.2**			

TABLE V G

INCIDENCE — AGE AND SEX DISTRIBUTION — URINARY ORGANS 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	1	0.3	0	0.0	1	0.1
30-39	2	2.5	3	3.8	5	3.2
40-49	5	9.4	2	3.7	7	6.6
50-59	32	65.9	14	27.7	46	46.5
60-69	54	127.0	16	32.7	70	76.5
70-79	49	186.3	17	50.2	66	109.8
80-89	23	255.5	19	131.0	42	178.7
90 and over	7	538.4	6	200.0	13	302.3
Age not stated	0	0.0	1	0.0	1	0.0
Total	**173**	**33.1**	**78**	**14.5**	**251**	**23.7**
(ii) Bladder						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	2	2.5	3	1.9
40-49	5	9.4	2	3.7	7	6.6
50-59	17	35.0	7	13.8	24	24.2
60-69	32	75.2	7	14.3	39	42.6
70-79	37	140.6	9	26.6	46	76.5
80-89	20	222.2	13	89.6	33	140.4
90 and over	7	538.4	6	200.0	13	302.3
Age not stated	0	0.0	0	0.0	0	0.0
Total	**119**	**22.8**	**46**	**8.5**	**165**	**15.6**
(iii) Kidney						
Under 30	1	0.3	0	0.0	1	0.1
30-39	1	1.2	1	1.2	2	1.2
40-49	0	0.0	0	0.0	0	0.0
50-59	14	28.8	6	11.9	20	20.2
60-69	20	47.0	7	14.3	27	29.5
70-79	9	34.2	8	23.6	17	28.2
80-89	2	22.2	4	27.5	6	25.5
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	1	0.0	1	0.0
Total	**47**	**9.0**	**27**	**5.0**	**74**	**7.0**

TABLE V H

INCIDENCE — AGE AND SEX DISTRIBUTION — SKIN 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total Skin						
Under 30	7	2.6	15	5.9	22	4.2
30-39	18	23.1	16	20.5	34	21.8
40-49	49	92.4	35	66.4	84	79.4
50-59	93	191.7	71	140.8	164	165.8
60-69	176	414.1	115	235.1	291	318.3
70-79	208	790.8	134	396.4	342	569.0
80-89	85	944.4	103	710.3	188	800.0
90 and over	17	1,307.6	26	866.6	43	1,000.0
Age not stated	4	0.0	4	0.0	8	0.0
Total	**657**	**125.9**	**519**	**97.0**	**1,176**	**111.3**
(ii) Melanoma						
Under 30	2	0.7	6	2.3	8	1.5
30-39	4	5.1	8	10.2	12	7.7
40-49	7	13.2	5	9.4	12	11.3
50-59	4	8.2	3	5.9	7	7.0
60-69	7	16.4	5	10.2	12	13.1
70-79	1	3.8	8	23.6	9	14.9
80-89	0	0.0	3	20.6	3	12.7
90 and over	2	153.8	1	33.3	3	69.7
Age not stated	0	0.0	0	0.0	0	0.0
Total	**27**	**5.1**	**39**	**7.2**	**66**	**6.2**
(iii) Other Malignant Neoplasms						
Under 30	5	1.9	9	3.5	14	2.7
30-39	14	17.9	8	10.2	22	14.1
40-49	42	79.2	30	56.9	72	68.1
50-59	89	183.5	68	134.9	157	158.7
60-69	169	397.6	110	224.9	279	305.2
70-79	207	787.0	126	372.7	333	554.0
80-89	85	944.4	100	689.6	185	787.2
90 and over	15	1,153.8	25	833.3	40	930.2
Age not stated	4	0.0	4	0.0	8	0.0
Total	**630**	**120.8**	**480**	**89.7**	**1,110**	**105.0**

TABLE V I

INCIDENCE — AGE AND SEX DISTRIBUTION BRAIN AND NERVOUS SYSTEM (INCLUDING EYE) 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	7	2.6	2	0.7	9	1.7
30-39	0	0.0	0	0.0	0	0.0
40-49	8	15.0	2	3.7	10	9.4
50-59	4	8.2	3	5.9	7	7.0
60-69	9	21.1	10	20.4	19	20.7
70-79	8	30.4	2	5.9	10	16.6
80-89	1	11.1	5	34.4	6	25.5
90 and over	4	307.6	0	0.0	4	93.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	41	7.8	24	4.4	65	6.1
(ii) Brain						
Under 30	7	2.6	1	0.3	8	1.5
30-39	0	0.0	0	0.0	0	0.0
40-49	6	11.3	0	0.0	6	5.6
50-59	3	6.1	2	3.9	5	5.0
60-69	5	11.7	9	18.4	14	15.3
70-79	6	22.8	2	5.9	8	13.3
80-89	1	11.1	4	27.5	5	21.2
90 and over	3	230.7	0	0.0	3	69.7
Age not stated	0	0.0	0	0.0	0	0.0
Total	31	5.9	18	3.3	49	4.6
(iii) Other Parts of Nervous System						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	1	1.8	0	0.0	1	0.9
50-59	0	0.0	0	0.0	0	0.0
60-69	0	0.0	1	2.0	1	1.0
70-79	0	0.0	0	0.0	0	0.0
80-89	0	0.0	0	0.0	0	0.0
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	1	0.1	1	0.1	2	0.1

TABLE V J

INCIDENCE
AGE AND SEX DISTRIBUTION — THYROID AND ENDOCRINE GLANDS 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	4	1.5	7	2.7	11	2.1
30-39	1	1.2	9	11.5	10	6.4
40-49	2	3.7	1	1.8	3	2.8
50-59	1	2.0	2	3.9	3	3.0
60-69	0	0.0	6	12.2	6	6.5
70-79	1	3.8	2	5.9	3	4.9
80-89	1	11.1	2	13.7	3	12.7
90 and over	0	0.0	1	33.3	1	23.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	10	1.9	30	5.6	40	3.7
(ii) Thyroid Glands						
Under 30	1	0.3	5	1.9	6	1.1
30-39	1	1.2	8	10.2	9	5.7
40-49	2	3.7	1	1.8	3	2.8
50-59	1	2.0	2	3.9	3	3.0
60-69	0	0.0	5	10.2	5	5.4
70-79	1	3.8	2	5.9	3	4.9
80-89	1	11.1	1	6.8	2	8.5
90 and over	0	0.0	1	33.3	1	23.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	7	1.3	25	4.6	32	3.0

TABLE V K

INCIDENCE — AGE AND SEX DISTRIBUTION — BONES 1984

	Male	Rate	Female	Rate	Total	Rate
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	1	1.8	0	0.0	1	0.9
50-59	0	0.0	0	0.0	0	0.0
60-69	2	4.7	1	2.0	3	3.2
70-79	1	3.8	1	2.9	2	3.3
80-89	1	11.1	0	0.0	1	4.2
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	5	0.9	2	0.3	7	0.6

TABLE V L

INCIDENCE — AGE AND SEX DISTRIBUTION — CONNECTIVE TISSUE 1984

	Male	Rate	Female	Rate	Total	Rate
Under 30	3	1.1	1	0.3	4	0.7
30-39	1	1.2	1	1.2	2	1.2
40-49	1	1.8	1	1.8	2	1.8
50-59	2	4.1	1	1.9	3	3.0
60-69	1	2.3	5	10.2	6	6.5
70-79	1	3.8	3	8.8	4	6.6
80-89	1	11.1	1	6.8	2	8.5
90 and over	0	0.0	1	33.3	1	23.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	**10**	**1.9**	**14**	**2.6**	**24**	**2.2**

TABLE V M

INCIDENCE — AGE AND SEX DISTRIBUTION
LYMPHATIC SYSTEM AND HAEMATOPOIETIC TISSUE 1983

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	19	7.2	11	4.3	30	5.8
30-39	7	8.9	7	8.9	14	8.9
40-49	12	22.6	7	13.2	19	17.9
50-59	19	39.1	18	35.7	37	37.4
60-69	38	89.4	31	63.3	69	75.4
70-79	54	205.3	30	88.7	84	139.7
80-89	18	200.0	34	234.4	52	221.2
90 and over	3	230.7	5	166.6	8	186.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**170**	**32.5**	**143**	**26.7**	**313**	**29.6**
(ii) Leukaemia and Aleukaemia						
Under 30	11	4.1	4	1.5	15	2.9
30-39	2	2.5	3	3.8	5	3.2
40-49	3	5.6	1	1.8	4	3.7
50-59	7	14.4	3	5.9	10	10.1
60-69	14	32.9	10	20.4	24	26.2
70-79	19	72.2	6	17.7	25	41.5
80-89	3	33.3	11	75.8	14	59.5
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**59**	**11.3**	**38**	**7.1**	**97**	**9.1**

(iii) Hodgkins Disease						
Under 30	4	1.5	6	2.3	**10**	**1.9**
30-39	0	0.0	2	2.5	**2**	**1.2**
40-49	2	3.7	0	0.0	**2**	**1.8**
50-59	0	0.0	0	0.0	**0**	**0.0**
60-69	1	2.3	1	2.0	**2**	**2.1**
70-79	1	3.8	0	0.0	**1**	**1.6**
80-89	2	22.2	1	6.8	**3**	**12.7**
90 and over	0	0.0	0	0.0	**0**	**0.0**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**10**	**1.9**	**10**	**1.8**	**20**	**1.8**
(iv) Other Lymphomas						
Under 30	4	1.5	1	0.3	**5**	**0.9**
30-39	5	6.4	1	1.2	**6**	**3.8**
40-49	7	13.2	6	11.3	**13**	**12.2**
50-59	9	18.5	12	23.8	**21**	**21.2**
60-69	20	47.0	16	32.7	**36**	**39.3**
70-79	23	87.4	20	59.1	**43**	**71.5**
80-89	9	100.0	16	110.3	**25**	**106.3**
90 and over	1	76.9	4	133.3	**5**	**116.2**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**78**	**14.9**	**76**	**14.2**	**154**	**14.5**
(v) Multiple Myeloma						
Under 30	0	0.0	0	0.0	**0**	**0.0**
30-39	0	0.0	1	1.2	**1**	**0.6**
40-49	0	0.0	0	0.0	**0**	**0.0**
50-59	3	6.1	3	5.9	**6**	**6.0**
60-69	3	7.0	4	8.1	**7**	**7.6**
70-79	11	41.8	4	11.8	**15**	**24.9**
80-89	4	44.4	6	41.3	**10**	**42.5**
90 and over	2	153.8	1	33.3	**3**	**69.7**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**23**	**4.4**	**19**	**3.5**	**42**	**3.9**

TABLE VI

INCIDENCE — SITES OF CANCER 1984

ICDA 9TH REV.	Site	Male	Female	Total
	Buccal Cavity and Pharynx			
140	Lip	62	14	76
141	Tongue	11	8	19
142	Salivary Glands	4	4	8
143	Gums	7	6	13
144	Floor of the Mouth	4	3	7
145	Other parts of Mouth	8	4	12
146	Oropharynx	10	0	10
147	Nasopharynx	9	1	10
148	Hypopharynx	8	0	8
149	Pharynx Unspecified	1	0	1
	Total	**124**	**40**	**164**
	Percent	**4.4**	1.3	**2.8**
	Digestive Organs			
150	Oesophagus	19	14	33
151	Stomach	79	43	122
152	Small Intestines	3	6	9
153	Large Intestines	197	216	413
154	Rectum and recto-sigmoid Junction	126	73	199
155	Liver and Intrahepatic Ducts	15	9	24
156	Gall Bladder and Extrahepatic Ducts	13	17	30
157	Pancreas	71	44	115
158	Peritoneum and Retroperitoneal Tissue	1	0	1
159	Digestive — N.O.S.	2	0	2
	Total	**526**	**422**	**948**
	Percent	**19.3**	**15.4**	**17.3**
	Respiratory System			
160	Nose, Nasal Cavities, Ear and Accessory	4	2	6
161	Larynx	37	*6*	43
162	Trachea, Bronchus and Lung	435	*182*	617
163-165	Other and Unspecified Respiratory Organs	7	*1*	8
	Total	**483**	**191**	**674**
	Percent	**17.7**	**7.0**	**12.4**

TABLE VI (CONT'D)

ICDA 9TH REV.	Site	Male	Female	Total
	Breast and Genito-Urinary Organs			
174-175	Breast	5	556	561
180, 233.1	Cervix Uteri	0	360	360
179-182,	Uterus-Corpus except Cervix	0	141	141
183	Ovary, Fallopian Tubes and Broad Ligaments	0	76	76
184, 236.1	Other Female Genital Organs	0	29	29
185	Prostate	420	0	420
186	Testis	17	0	17
187	Other Male Genital Organs	5	0	5
188	Bladder	119	46	165
189	Other and Unspecified Urinary Organs	54	32	86
	Total	620	1,240	1,860
	Percent	22.7	45.1	33.9
	Other and Unspecified Sites			
172	Malignant Melanoma of Skin	27	39	66
173	Malignant Neoplasm of Skin	630	480	1,110
190	Eye	9	5	14
191	Brain	31	18	49
192	Other Parts of Nervous System	1	1	2
193	Thyroid Glands	7	25	32
194, 164.0	Endocrine Glands	3	4	7
170	Bones	5	2	7
171	Connective Tissue	10	14	24
195-9	Other and Unspecified Sites	66	77	143
	Total	789	665	1,454
	Percent	28.9	24.6	26.7

	Lymphatic and Haematopoietic System			
200	Lymphosarcoma and Reticulosarcoma	54	47	**101**
201	Hodgkins Disease	10	10	**20**
202	Other Lymphomas (Recticulosis)	24	29	**53**
203	Multiple Myeloma	23	19	**42**
204-8	Leukaemia and Aleukemia	59	38	**97**
238.4	Polycythemia Vera	6	5	**11**
289.0	Myelofibrosis	6	5	**11**
	Total	**182**	**153**	**335**
	Percent	**6.6**	**5.6**	**6.1**
	TOTAL — ALL SITES	**2,724**	**2,711**	**5,435**
	Percent	**100.0**	**100.0**	**100.0**

TABLE VII

MORTALITY — PLACE OF DEATH OF CANCER PATIENTS 1984

Place of Death	Male	Female	Total
Hospitals — Greater Winnipeg	704	574	1,278
Hospitals — Outside Greater Winnipeg	348	254	602
Nursing Homes	5	6	11
Other — Greater Winnipeg	47	64	111
Other — Outside Greater Winnipeg	55	39	94
Total	**1,159**	**937**	**2,096**

TABLE VIII

MORTALITY — RESIDENCE OF CANCER DEATHS 1984

Residence	Male	Female	Total
Greater Winnipeg	747	633	1,380
Manitoba, Outside Greater Winnipeg	402	290	692
Other Provinces	9	13	22
United States of America	1	0	1
Outside Canada and U.S.A.	0	1	1
Residence Not Stated	0	0	0
Total	**1,159**	**937**	**2,096**

TABLE IX

MORTALITY
RESIDENTIAL DISTRIBUTION OF PATIENTS DYING OF CANCER 1984

Residence	Male	Rate	Female	Rate	Total	Rate
Division 1	18	214.1	5	64.1	23	142.0
Division 2	21	109.3	19	102.9	40	106.2
Division 3	33	179.9	28	151.4	61	165.6
Division 4	14	232.7	3	52.6	17	145.1
Division 5	15	174.7	17	201.7	32	188.1
Division 6	7	129.1	6	111.7	13	120.4
Division 7	85	320.1	62	222.3	147	270.0
Division 8	8	104.8	8	111.0	16	107.8
Division 9	24	204.6	14	119.0	38	161.7
Division 10	0	0.0	1	29.9	1	14.2
Division 11	747	274.7	633	216.3	1,380	244.4
Division 12	9	118.0	6	83.6	15	101.3
Division 13	23	146.1	10	65.1	33	106.1
Division 14	6	83.7	4	60.9	10	72.8
Division 15	29	230.8	24	197.1	53	214.2
Division 16	6	103.8	5	90.0	11	97.0
Division 17	36	253.9	30	215.2	66	234.7
Division 18	20	178.2	14	132.5	34	156.1
Division 19	2	31.1	0	0.0	2	16.3
Division 20	18	279.9	13	211.7	31	246.6
Division 21	20	156.9	17	141.9	37	149.7
Division 22	8	57.5	3	23.4	11	41.2
Division 23	0	0.0	1	21.2	1	9.9
Total	**1,149**	**226.8**	**923**	**181.4**	**2,072**	**204.0**

TABLE X

MORTALITY

AGE AND SEX DISTRIBUTION OF TOTAL CANCER DEATHS 1984

Age Group	Male	Rate	Female	Rate	Total	Rate
0-4	4	9.6	3	7.7	7	8.7
5-9	1	2.5	0	0.0	1	1.2
10-14	0	0.0	0	0.0	0	0.0
15-19	0	0.0	3	7.0	3	3.4
20-24	1	1.9	0	0.0	1	1.0
25-29	7	15.2	3	6.5	10	10.9
30-34	6	14.5	4	9.6	10	12.0
35-39	10	27.3	7	19.2	17	23.3
40-44	13	45.6	13	45.9	26	45.7
45-49	30	122.4	34	139.3	64	130.8
50-54	56	228.5	43	174.0	99	201.2
55-59	87	362.5	70	272.3	157	315.8
60-64	154	666.6	89	334.5	243	488.9
65-69	164	845.3	121	542.6	285	683.4
70-74	203	1,276.7	154	793.8	357	1,011.3
75-79	167	1,605.7	137	951.3	304	1,225.8
80-84	141	2,238.0	104	1,118.2	245	1,570.5
85-89	61	2,259.2	72	1,384.6	133	1,683.5
90 and over	44	3,384.6	66	2,200.0	110	2,558.1
Unknown	0	0.0	0	0.0	0	0.0
Total	**1,149**	**220.3**	**923**	**172.5**	**2,072**	**196.1**

TABLE X A

MORTALITY
AGE AND SEX ANALYSIS — BUCCAL CAVITY AND PHARNYX 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	2	3.7	0	0.0	2	1.8
50-59	9	18.5	3	5.9	12	12.1
60-69	9	21.1	2	4.0	11	12.0
70-79	3	11.4	2	5.9	5	8.3
80-89	5	55.5	0	0.0	5	21.2
90 and over	1	76.9	1	33.3	2	46.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**29**	**5.5**	**8**	**1.4**	**37**	**3.5**
(ii) Lip						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	0	0.0	0	0.0	0	0.0
50-59	0	0.0	0	0.0	0	0.0
60-69	0	0.0	0	0.0	0	0.0
70-79	0	0.0	0	0.0	0	0.0
80-89	1	11.1	0	0.0	1	4.2
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**1**	**0.1**	**0**	**0.0**	**1**	**0.0**

TABLE X B

MORTALITY
AGE AND SEX ANALYSIS — DIGESTIVE SYSTEM 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	1	0.3	0	0.0	1	0.1
30-39	4	5.1	3	3.8	7	4.4
40-49	16	30.1	4	7.5	20	18.9
50-59	46	94.8	20	39.6	66	66.7
60-69	89	209.4	56	114.5	145	158.6
70-79	115	437.2	89	263.3	204	339.4
80-89	61	677.7	64	441.3	125	531.9
90 and over	11	846.1	21	700.0	32	744.1
Age not stated	0	0.0	0	0.0	0	0.0
Total	**343**	**65.7**	**257**	**48.0**	**600**	**56.7**
(ii) Oesophagus						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	2	3.7	0	0.0	2	1.8
50-59	4	8.2	2	3.9	6	6.0
60-69	5	11.7	3	6.1	8	8.7
70-79	8	30.4	5	14.7	13	21.6
80-89	3	33.3	0	0.0	3	12.7
90 and over	1	76.9	0	0.0	1	23.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	**23**	**4.4**	**10**	**1.8**	**33**	**3.1**
(iii) Stomach						
Under 30	1	0.3	0	0.0	1	0.1
30-39	0	0.0	0	0.0	0	0.0
40-49	2	3.7	1	1.8	3	2.8
50-59	8	16.4	3	5.9	11	11.1
60-69	17	40.0	7	14.3	24	26.2
70-79	22	83.6	14	41.4	36	59.9
80-89	21	233.3	13	89.6	34	144.6
90 and over	2	153.8	3	100.0	5	116.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	**73**	**13.9**	**41**	**7.6**	**114**	**10.7**

(iv) Large Intestine						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	2	2.5	3	1.9
40-49	3	5.6	1	1.8	4	3.7
50-59	8	16.4	6	11.9	14	14.1
60-69	25	58.8	18	36.8	43	47.0
70-79	28	106.4	29	85.7	57	94.8
80-89	18	200.0	23	158.6	41	174.4
90 and over	2	153.8	7	233.3	9	209.3
Age not stated	0	0.0	0	0.0	0	0.0
Total	**85**	**16.2**	**86**	**16.0**	**171**	**16.1**
(v) Rectum and Recto-Sigmoid Junction						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	0	0.0	1	0.6
40-49	1	1.8	0	0.0	1	0.9
50-59	9	18.5	1	1.9	10	10.1
60-69	13	30.5	7	14.3	20	21.8
70-79	18	68.4	4	11.8	22	36.6
80-89	3	33.3	8	55.1	11	46.8
90 and over	3	230.7	2	66.6	5	116.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	**48**	**9.2**	**22**	**4.1**	**70**	**6.6**
(vi) Liver and Biliary Passages						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	0	0.0	1	0.6
40-49	0	0.0	0	0.0	0	0.0
50-59	5	10.3	0	0.0	5	5.0
60-69	5	11.7	8	16.3	13	14.2
70-79	9	34.2	10	29.5	19	31.6
80-89	4	44.4	7	48.2	11	46.8
90 and over	2	153.8	4	133.3	6	139.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**26**	**4.9**	**29**	**5.4**	**55**	**5.2**

(vii) Pancreas						
Under 30	0	0.0	0	0.0	**0**	**0.0**
30-39	0	0.0	0	0.0	**0**	**0.0**
40-49	5	9.4	2	3.7	**7**	**6.6**
50-59	11	22.6	6	11.9	**17**	**17.1**
60-69	21	49.4	12	24.5	**33**	**36.1**
70-79	23	87.4	23	68.0	**46**	**76.5**
80-89	11	122.2	11	75.8	**22**	**93.6**
90 and over	1	76.9	3	100.0	**4**	**93.0**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**72**	**13.8**	**57**	**10.6**	**129**	**12.2**

TABLE X C

MORTALITY
AGE AND SEX ANALYSIS — RESPIRATORY SYSTEM 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	0	0.0	0	0.0	0	0.0
30-39	4	5.1	0	0.0	4	2.5
40-49	13	24.5	7	13.2	20	18.9
50-59	47	96.9	20	39.6	67	67.7
60-69	120	282.3	48	98.1	168	183.8
70-79	109	414.4	50	147.9	159	264.5
80-89	43	477.7	20	137.9	63	268.0
90 and over	4	307.6	2	66.6	6	139.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**340**	**65.1**	**147**	**27.4**	**487**	**46.0**
(ii) Larynx						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	0	0.0	1	0.6
40-49	1	1.8	0	0.0	1	0.9
50-59	0	0.0	0	0.0	0	0.0
60-69	7	16.4	1	2.0	8	8.7
70-79	2	7.6	1	2.9	3	4.9
80-89	1	11.1	0	0.0	1	4.2
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**12**	**2.3**	**2**	**0.3**	**14**	**1.3**
(iii) Trachea, Bronchus, and Lung						
Under 30	0	0.0	0	0.0	0	0.0
30-39	3	3.8	0	0.0	3	1.9
40-49	12	22.6	7	13.2	19	17.9
50-59	46	94.8	20	39.6	66	66.7
60-69	112	263.5	46	94.0	158	172.8
70-79	107	406.8	49	144.9	156	259.5
80-89	42	466.6	20	137.9	62	263.8
90 and over	4	307.6	2	66.6	6	139.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**326**	**62.5**	**144**	**26.9**	**470**	**44.4**

TABLE X D

MORTALITY
AGE AND SEX ANALYSIS — BREAST 1984

	Male	Rate	Female	Rate	Total	Rate
Under 30	0	0.0	0	0.0	**0**	**0.0**
30-39	0	0.0	4	5.1	**4**	**2.5**
40-49	0	0.0	12	22.7	**12**	**11.3**
50-59	1	2.0	40	79.3	**41**	**41.4**
60-69	0	0.0	36	73.6	**36**	**39.3**
70-79	0	0.0	47	139.0	**47**	**78.2**
80-89	0	0.0	25	172.4	**25**	**106.3**
90 and over	0	0.0	10	333.3	**10**	**232.5**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**1**	**0.1**	**174**	**32.5**	**175**	**16.5**

TABLE X E

MORTALITY
AGE AND SEX ANALYSIS — FEMALE GENITAL ORGANS 1984

(i) All organs	Female	Rate
Under 30	3	1.1
30-39	2	2.5
40-49	8	15.1
50-59	12	23.8
60-69	22	44.9
70-79	40	118.3
80-89	19	131.0
90 and over	4	133.3
Age not stated	0	0.0
Total	**110**	**20.5**

(ii) Cervix Uteri	Female	Rate
Under 30	2	0.7
30-39	2	2.5
40-49	4	7.5
50-59	2	3.9
60-69	2	4.0
70-79	4	11.8
80-89	4	27.5
90 and over	0	0.0
Age not stated	0	0.0
Total	**20**	**3.7**

(iii) Uterus-Corpus etc. (Except Cervix)	Female	Rate
Under 30	0	0.0
30-39	0	0.0
40-49	0	0.0
50-59	3	5.9
60-69	8	16.3
70-79	5	14.7
80-89	5	34.4
90 and over	2	66.6
Age not stated	0	0.0
Total	**23**	**4.2**

(iv) Ovaries, Fallopian Tubes, Broad Ligaments and other Genital Organs	Female	Rate
Under 30	1	0.3
30-39	0	0.0
40-49	4	7.5
50-59	7	13.8
60-69	12	24.5
70-79	31	91.7
80-89	10	66.6
90 and over	2	66.6
Age not stated	0	0.0
Total	**67**	**12.5**

TABLE X F

MORTALITY

AGE AND SEX ANALYSIS — MALE GENITAL ORGANS 1984

	Male	Rate
(i) All Organs		
Under 30	2	0.7
30-39	1	1.2
40-49	0	0.0
50-59	3	6.1
60-69	18	42.3
70-79	56	212.9
80-89	43	477.7
90 and over	13	1,000.0
Age not stated	0	0.0
Total	**136**	**26.0**

	Male	Rate
(ii) Prostate		
Under 30	0	0.0
30-39	0	0.0
40-49	0	0.0
50-59	3	6.1
60-69	18	42.3
70-79	55	209.1
80-89	43	477.7
90 and over	13	1,000.0
Age not stated	0	0.0
Total	132	25.3

	Male	Rate
(iii) Other Male Genital Organs		
Under 30	2	0.7
30-39	1	1.2
40-49	0	0.0
50-59	0	0.0
60-69	0	0.0
70-79	1	3.8
80-89	0	0.0
90 and over	0	0.0
Age not stated	0	0.0
Total	**4**	**0.7**

TABLE X G

MORTALITY

AGE AND SEX ANALYSIS — URINARY ORGANS 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	0	0.0	0	0.0	**0**	**0.0**
30-39	1	1.2	0	0.0	**1**	**0.6**
40-49	1	1.8	2	3.7	**3**	**2.8**
50-59	7	14.4	1	1.9	**8**	**8.0**
60-69	20	47.0	4	8.1	**24**	**26.2**
70-79	13	49.4	12	35.5	**25**	**41.5**
80-89	16	177.7	8	55.1	**24**	**102.1**
90 and over	1	76.9	3	100.0	**4**	**93.0**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**59**	**11.3**	**30**	**5.6**	**89**	**8.4**
(ii) Bladder						
Under 30	0	0.0	0	0.0	**0**	**0.0**
30-39	0	0.0	0	0.0	**0**	**0.0**
40-49	0	0.0	1	1.8	**1**	**0.9**
50-59	1	2.0	0	0.0	**1**	**1.0**
60-69	5	11.7	1	2.0	**6**	**6.5**
70-79	10	38.0	2	5.9	**12**	**19.9**
80-89	11	122.2	4	27.5	**15**	**63.8**
90 and over	1	76.9	3	100.0	**4**	**93.0**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**28**	**5.3**	**11**	**2.0**	**39**	**3.6**
(iii) Kidney						
Under 30	0	0.0	0	0.0	**0**	**0.0**
30-39	1	1.2	0	0.0	**1**	**0.6**
40-49	1	1.8	1	1.8	**2**	**1.8**
50-59	6	12.3	1	1.9	**7**	**7.0**
60-69	15	35.2	3	6.1	**18**	**19.6**
70-79	3	11.4	10	29.5	**13**	**21.6**
80-89	5	55.5	4	27.5	**9**	**38.2**
90 and over	0	0.0	0	0.0	**0**	**0.0**
Age not stated	0	0.0	0	0.0	**0**	**0.0**
Total	**31**	**5.9**	**19**	**3.5**	**50**	**4.7**

TABLE X H

MORTALITY
AGE AND SEX ANALYSIS — SKIN 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total Skin						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	1	1.2	2	1.2
40-49	1	1.8	2	3.7	3	2.8
50-59	0	0.0	0	0.0	0	0.0
60-69	2	4.7	4	8.1	6	6.5
70-79	1	3.8	1	2.9	2	3.3
80-89	1	11.1	1	6.8	2	8.5
90 and over	2	153.8	1	33.3	3	69.7
Age not stated	0	0.0	0	0.0	0	0.0
Total	**8**	**1.5**	**10**	**1.8**	**18**	**1.7**
(ii) Melanoma						
Under 30	0	0.0	0	0.0	0	0.0
30-39	1	1.2	1	1.2	2	1.2
40-49	1	1.8	2	3.7	3	2.8
50-59	0	0.0	0	0.0	0	0.0
60-69	1	2.3	4	8.1	5	5.4
70-79	1	3.8	1	2.9	2	3.3
80-89	1	11.1	1	6.8	2	8.5
90 and over	2	153.8	1	33.3	3	69.7
Age not stated	0	0.0	0	0.0	0	0.0
Total	**7**	**1.3**	**10**	**1.8**	**17**	**1.6**
(iii) Other Malignant Neoplasms						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	0	0.0	0	0.0	0	0.0
50-59	0	0.0	0	0.0	0	0.0
60-69	1	2.3	0	0.0	1	1.0
70-79	0	0.0	0	0.0	0	0.0
80-89	0	0.0	0	0.0	0	0.0
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**1**	**0.1**	**0**	**0.0**	**1**	**0.0**

TABLE X I

MORTALITY

AGE AND SEX ANALYSIS — BRAIN AND NERVOUS SYSTEM 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	3	1.1	2	0.7	5	0.9
30-39	2	2.5	1	1.2	3	1.9
40-49	4	7.5	2	3.7	6	5.6
50-59	7	14.4	0	0.0	7	7.0
60-69	5	11.7	5	10.2	10	10.9
70-79	4	15.2	2	5.9	6	9.9
80-89	1	11.1	3	20.6	4	17.0
90 and over	2	153.8	0	0.0	2	46.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**28**	**5.3**	**15**	**2.8**	**43**	**4.0**
(ii) Brain						
Under 30	3	1.1	2	0.7	5	0.9
30-39	2	2.5	0	0.0	2	1.2
40-49	4	7.5	2	3.7	6	5.6
50-59	7	14.4	0	0.0	7	7.0
60-69	5	11.7	5	10.2	10	10.9
70-79	4	15.2	2	5.9	6	9.9
80-89	1	11.1	3	20.6	4	17.0
90 and over	2	153.8	0	0.0	2	46.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**28**	**5.3**	**14**	**2.6**	**42**	**3.9**
(iii) Other Parts of Nervous System						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	1	1.2	1	0.6
40-49	0	0.0	0	0.0	0	0.0
50-59	0	0.0	0	0.0	0	0.0
60-69	0	0.0	0	0.0	0	0.0
70-79	0	0.0	0	0.0	0	0.0
80-89	0	0.0	0	0.0	0	0.0
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**1**	**0.0**	**1**	**0.1**	**1**	**0.0**

TABLE X J

MORTALITY
AGE AND SEX ANALYSIS — THYROID AND ENDOCRINE GLANDS 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	0	0.0	0	0.0	0	0.0
50-59	0	0.0	1	1.9	1	1.0
60-69	2	4.7	1	2.0	3	3.2
70-79	0	0.0	0	0.0	0	0.0
80-89	1	11.1	1	6.8	2	8.5
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**3**	**0.5**	**3**	**0.5**	**6**	**0.5**
(ii) Thyroid Glands						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	0	0.0	0	0.0	0	0.0
50-59	0	0.0	1	1.9	1	1.0
60-69	1	2.3	1	2.0	2	2.1
70-79	0	0.0	0	0.0	0	0.0
80-89	1	11.1	1	6.8	2	8.5
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**2**	**0.3**	**3**	**0.5**	**5**	**0.4**

TABLE X K

MORTALITY
AGE AND SEX ANALYSIS — BONES 1984

	Male	Rate	Female	Rate	Total	Rate
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	0	0.0	0	0.0	0	0.0
50-59	1	2.0	0	0.0	1	1.0
60-69	0	0.0	0	0.0	0	0.0
70-79	2	7.6	0	0.0	2	3.3
80-89	1	11.1	0	0.0	1	4.2
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**4**	**0.7**	**0**	**0.0**	**4**	**0.3**

TABLE X L

MORTALITY
AGE AND SEX ANALYSIS — CONNECTIVE TISSUE 1983

	Male	Rate	Female	Rate	Total	Rate
Under 30	1	0.3	0	0.0	1	0.1
30-39	0	0.0	0	0.0	0	0.0
40-49	0	0.0	0	0.0	0	0.0
50-59	2	4.1	1	1.9	3	3.0
60-69	3	7.0	5	10.2	8	8.7
70-79	1	3.8	4	11.8	5	8.3
80-89	0	0.0	0	0.0	0	0.0
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**7**	**1.3**	**10**	**1.8**	**17**	**1.6**

TABLE X M

MORTALITY
AGE AND SEX ANALYSIS — LYMPHATIC SYSTEM AND HAEMATOPOIETIC TISSUE 1984

	Male	Rate	Female	Rate	Total	Rate
(i) Total System						
Under 30	6	2.2	4	1.5	10	1.9
30-39	0	0.0	0	0.0	0	0.0
40-49	4	7.5	4	7.5	8	7.5
50-59	10	20.6	5	9.9	15	15.1
60-69	25	58.8	14	28.6	39	42.6
70-79	43	163.4	26	76.9	69	114.8
80-89	20	222.2	19	131.0	39	165.9
90 and over	2	153.8	11	366.6	13	302.3
Age not stated	0	0.0	0	0.0	0	0.0
Total	**110**	**21.0**	**83**	**15.5**	**193**	**18.2**
(ii) Leukaemia and Aleukaemia						
Under 30	5	1.9	2	0.7	7	1.3
30-39	0	0.0	0	0.0	0	0.0
40-49	2	3.7	2	3.7	4	3.7
50-59	7	14.4	0	0.0	7	7.0
60-69	12	28.2	2	4.0	14	15.3
70-79	19	72.2	9	26.6	28	46.5
80-89	10	111.1	4	27.5	14	59.5
90 and over	0	0.0	5	166.6	5	116.2
Age not stated	0	0.0	0	0.0	0	0.0
Total	**55**	**10.5**	**24**	**4.4**	**79**	**7.4**
(iii) Hodgkins Disease						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	0	0.0	0	0.0	0	0.0
50-59	0	0.0	1	1.9	1	1.0
60-69	0	0.0	1	2.0	1	1.0
70-79	2	7.6	0	0.0	2	3.3
80-89	1	11.1	0	0.0	1	4.2
90 and over	0	0.0	0	0.0	0	0.0
Age not stated	0	0.0	0	0.0	0	0.0
Total	**3**	**0.5**	**2**	**0.3**	**5**	**0.4**

(iv) Other Lymphomas						
Under 30	1	0.3	2	0.7	3	0.5
30-39	0	0.0	0	0.0	0	0.0
40-49	1	1.8	0	0.0	1	0.9
50-59	2	4.1	2	3.9	4	4.0
60-69	9	21.1	8	16.3	17	18.5
70-79	14	53.2	13	38.4	27	44.9
80-89	5	55.5	10	68.9	15	63.8
90 and over	1	76.9	5	166.6	6	139.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**33**	**6.3**	**40**	**7.4**	**73**	**6.9**
(v) Multiple Myeloma						
Under 30	0	0.0	0	0.0	0	0.0
30-39	0	0.0	0	0.0	0	0.0
40-49	1	1.8	2	3.7	3	2.8
50-59	1	2.0	2	3.9	3	3.0
60-69	4	9.4	3	6.1	7	7.6
70-79	8	30.4	4	11.8	12	19.9
80-89	4	44.4	5	34.4	9	38.2
90 and over	1	76.9	1	33.3	2	46.5
Age not stated	0	0.0	0	0.0	0	0.0
Total	**19**	**3.6**	**17**	**3.1**	**36**	**3.4**

TRENDS IN CANCER
MANITOBA 1964-1984

FIGURE 3

BUCCAL CAVITY AND PHARYNX

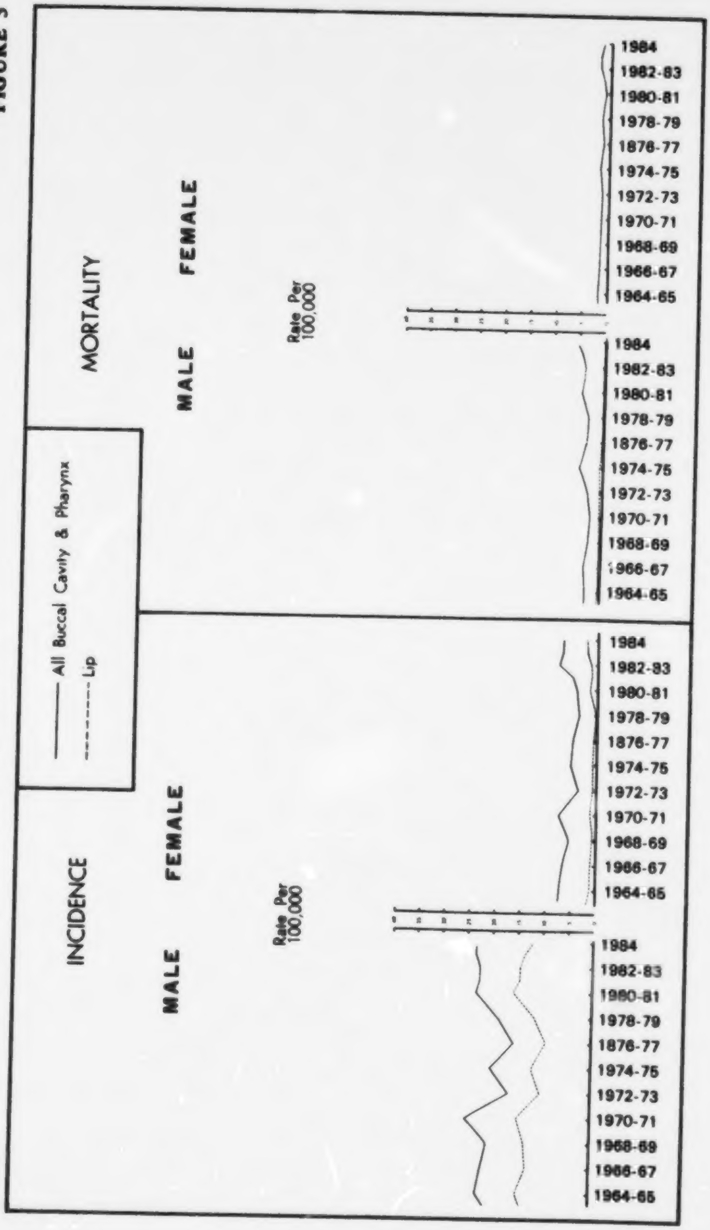


FIGURE 3 (Cont'd.)

DIGESTIVE SYSTEM

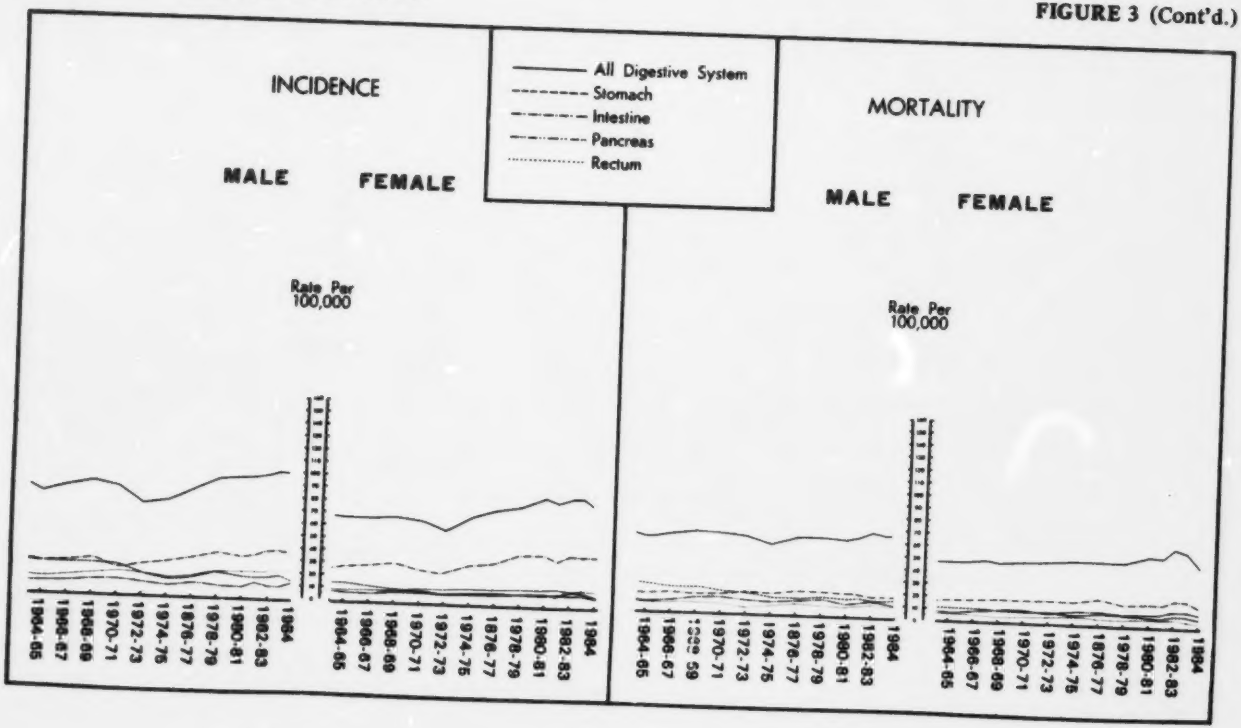


FIGURE 3 (Cont'd.)

RESPIRATORY SYSTEM

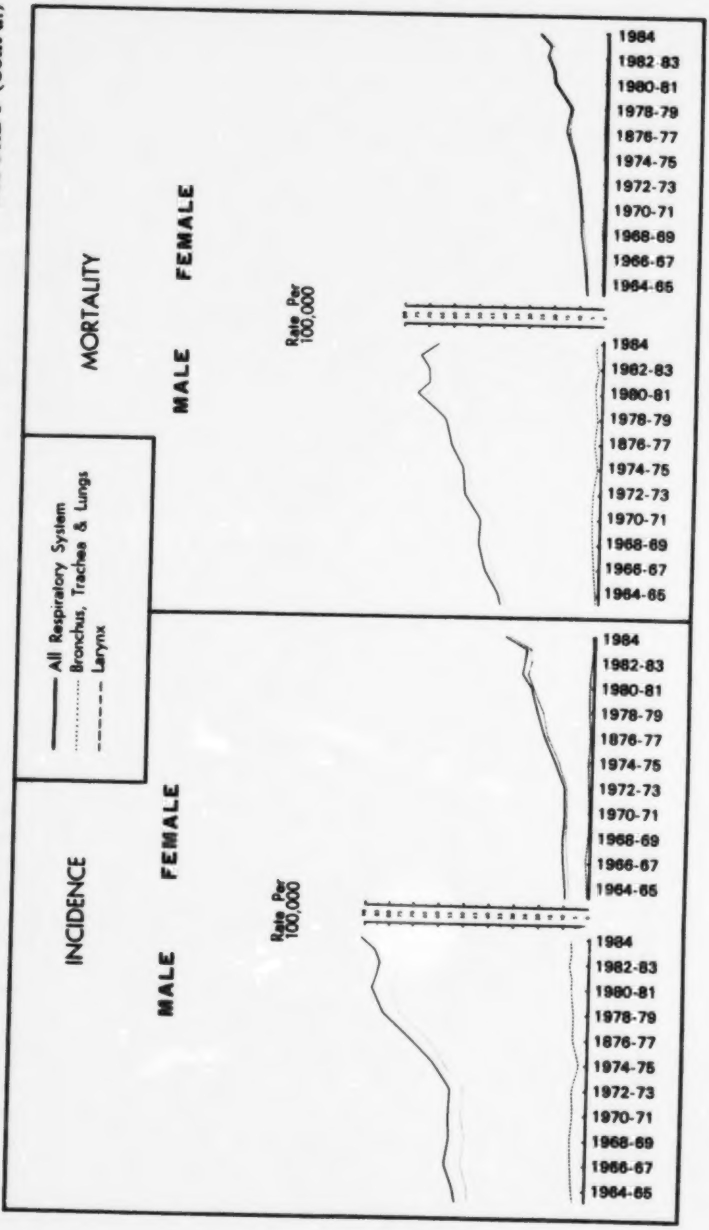


FIGURE 3 (Cont'd.)

BREAST

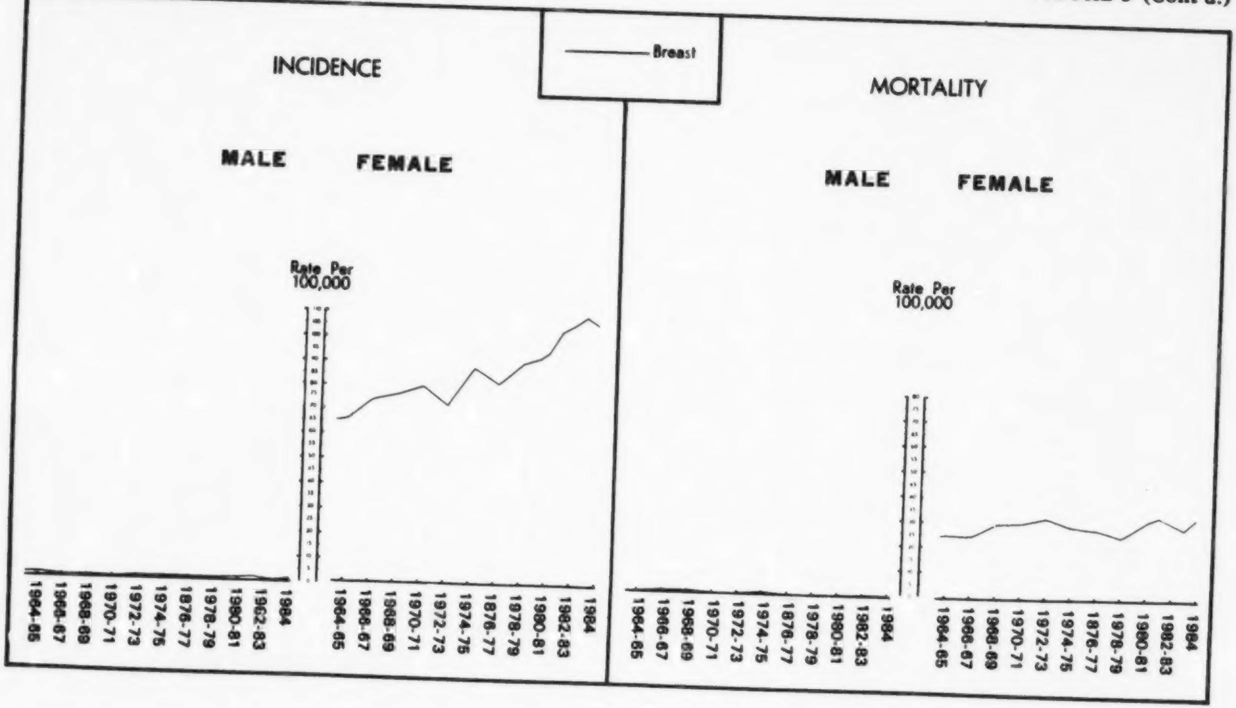


FIGURE 3 (Cont'd.)

GENITAL ORGANS

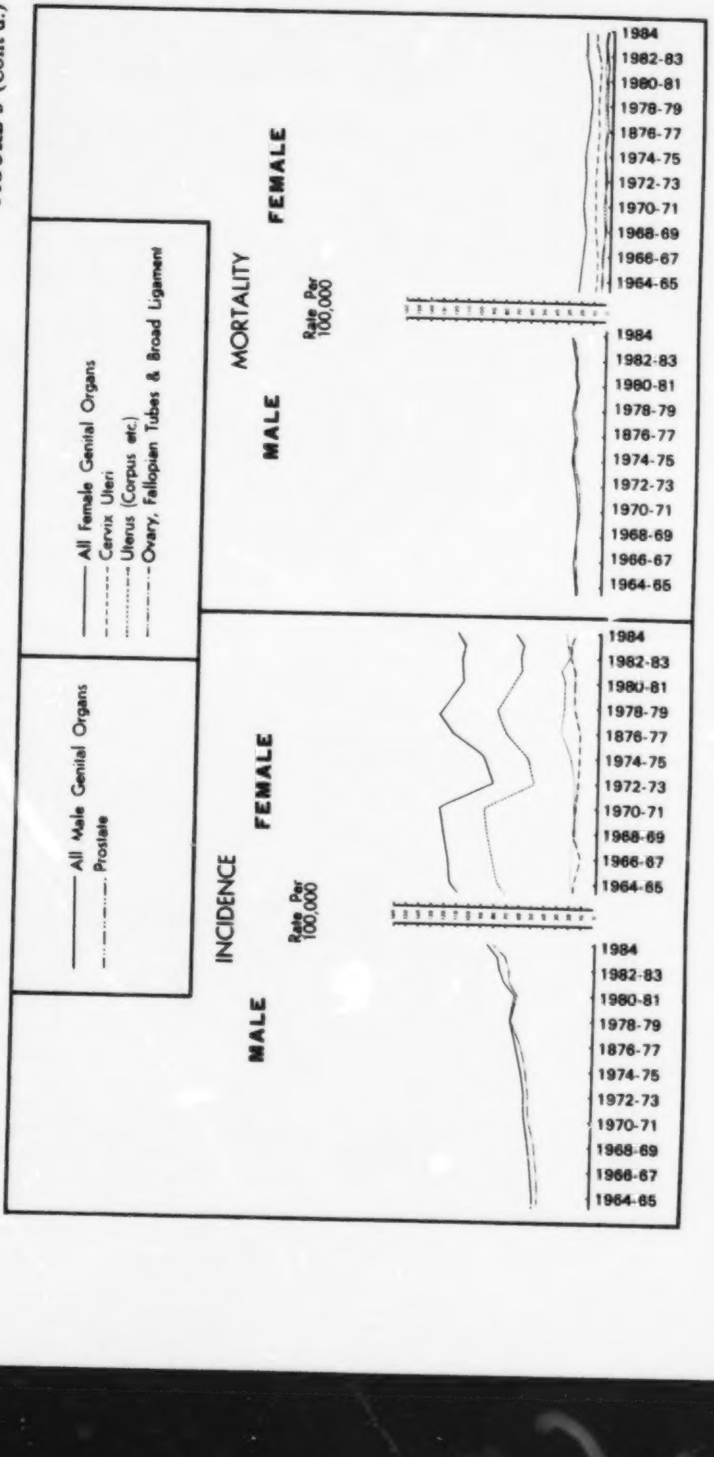


FIGURE 3 (Cont'd.)

URINARY ORGANS

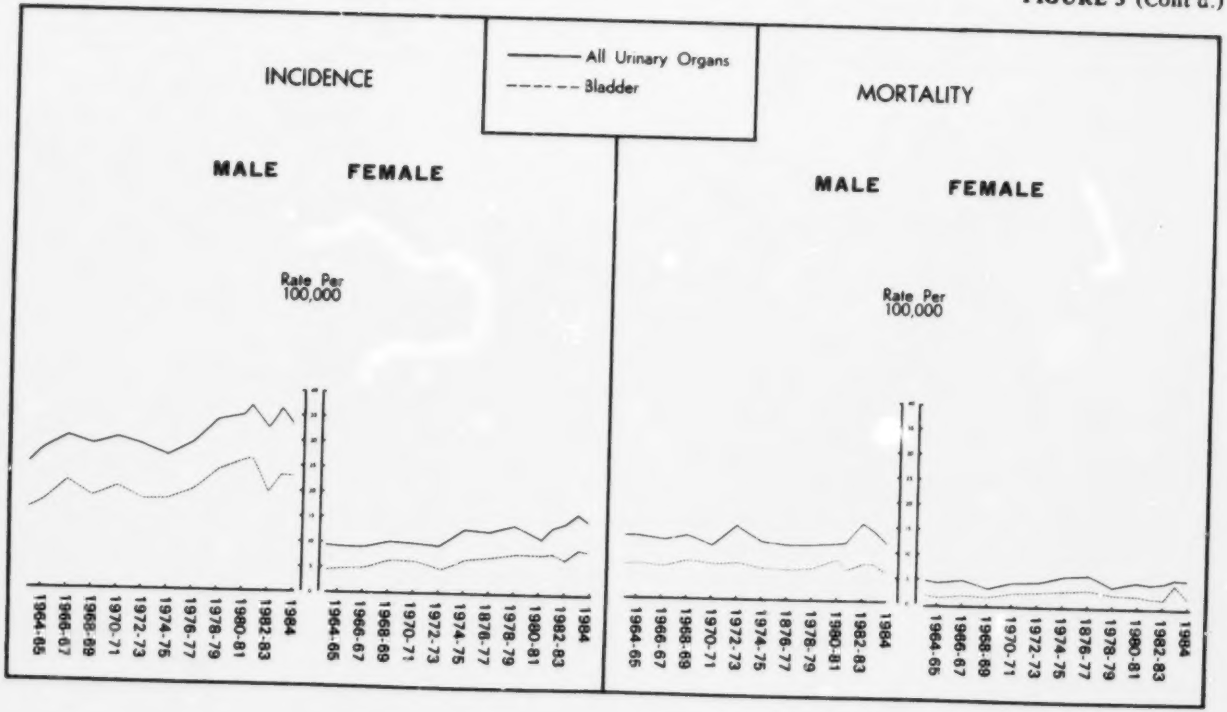
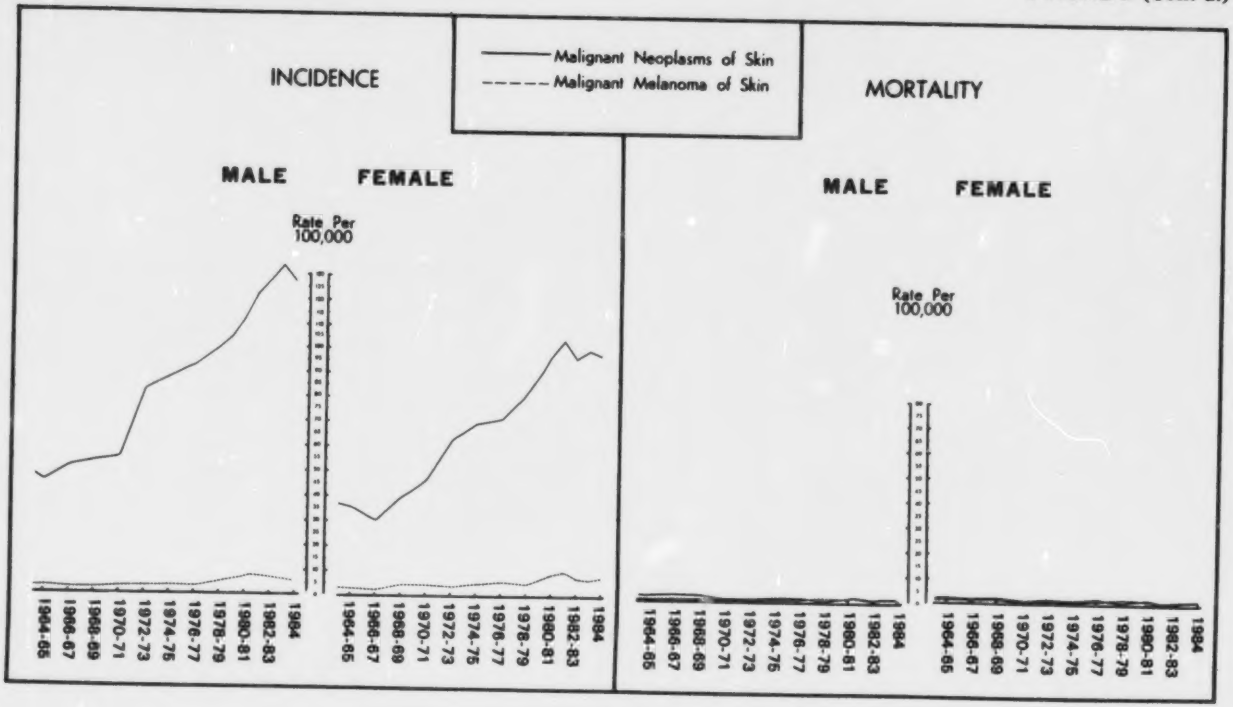


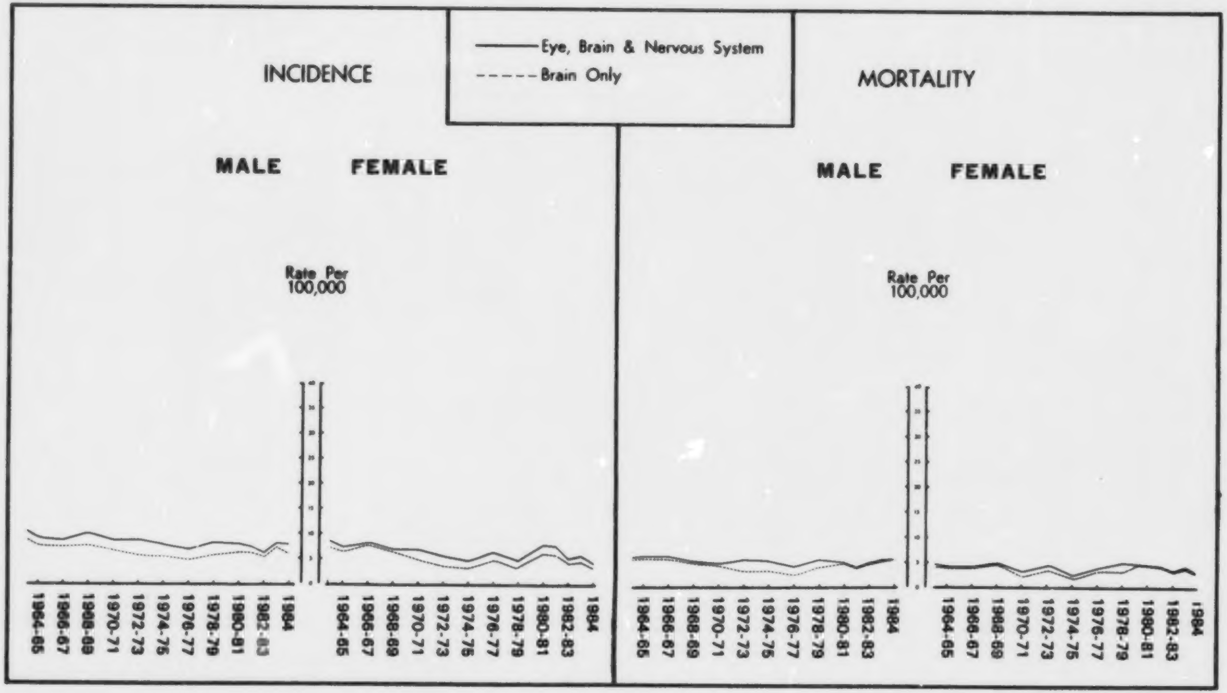
FIGURE 3 (Cont'd.)

SKIN



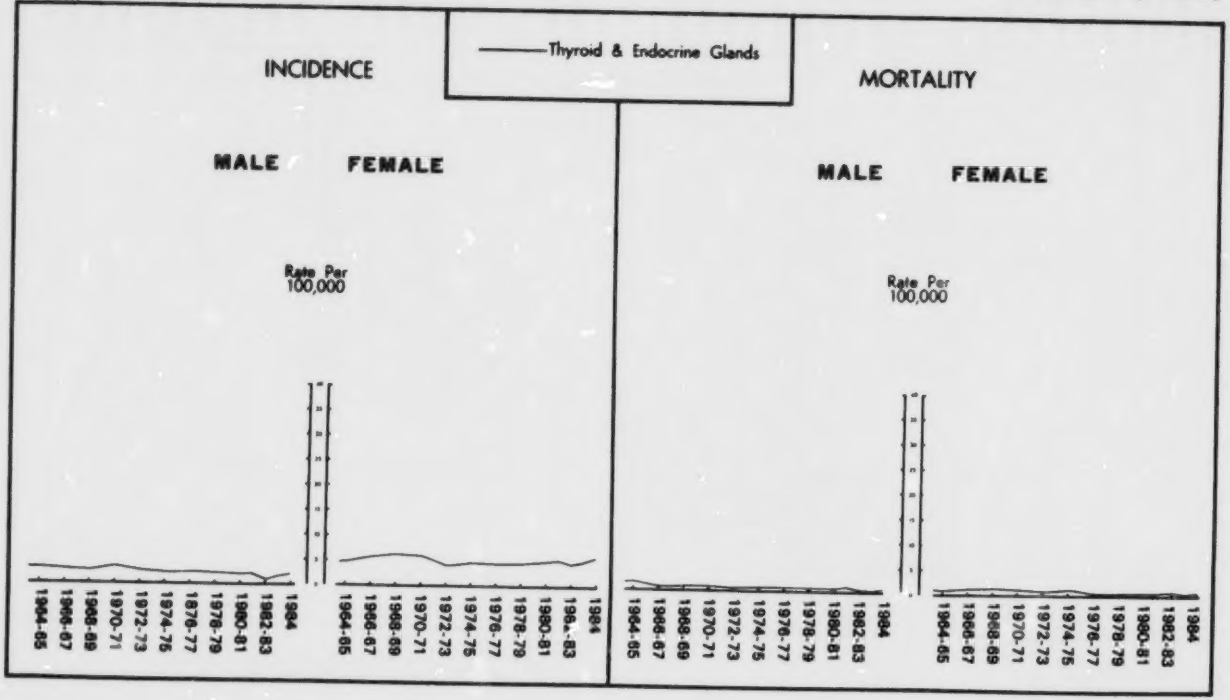
BRAIN AND NERVOUS SYSTEM

FIGURE 3 (Cont'd.)



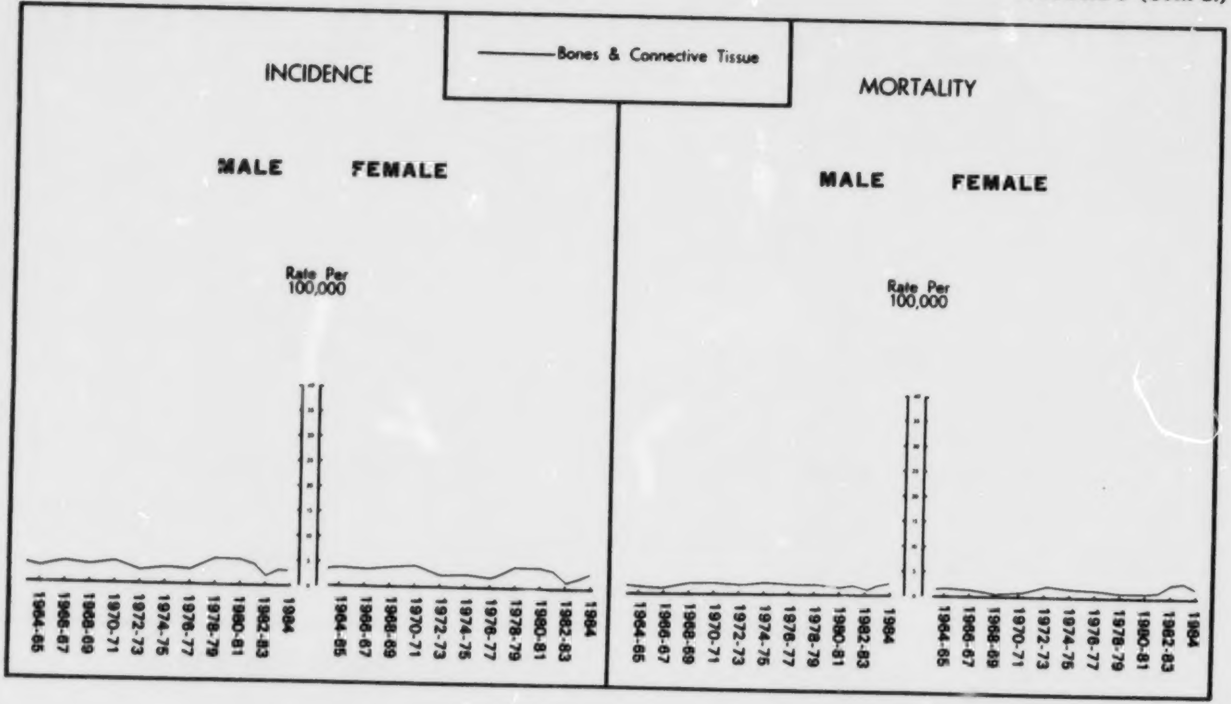
THYROID AND ENDOCRINE GLANDS

FIGURE 3 (Cont'd.)



BONES AND CONNECTIVE TISSUE

FIGURE 3 (Cont'd.)



OTHER AND UNSPECIFIED SITES

FIGURE 3 (Cont'd.)

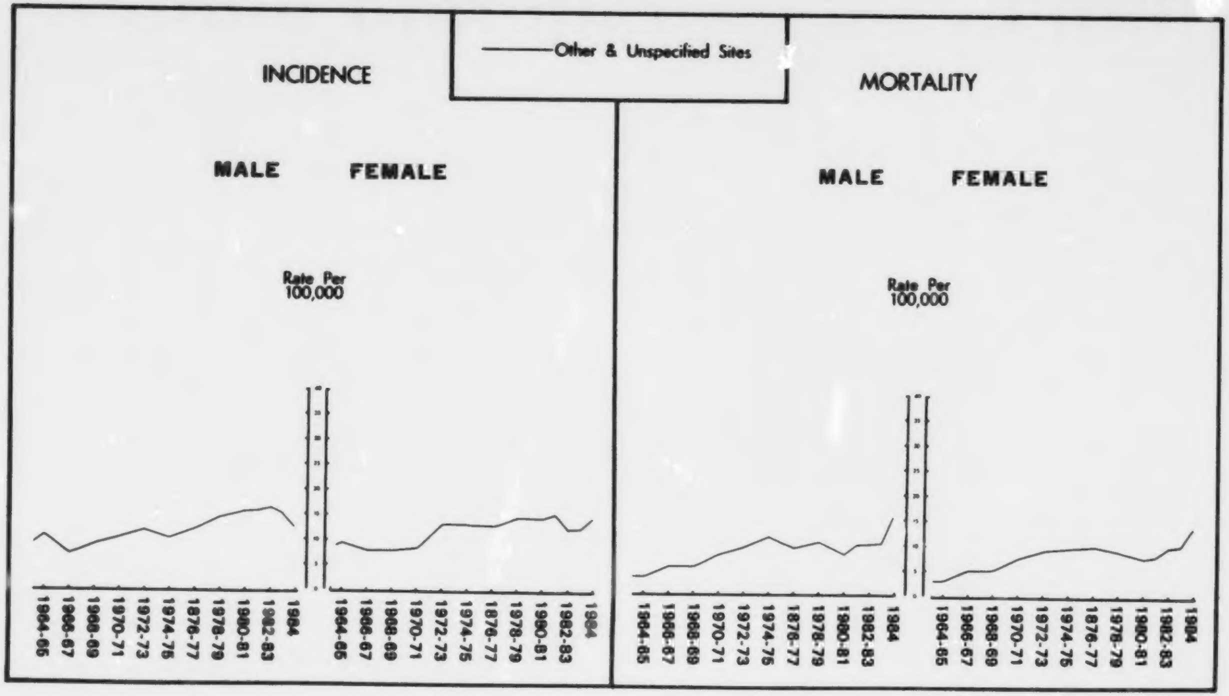


FIGURE 3 (Cont'd.)

LYMPHATIC AND HAEMATOPOIETIC SYSTEM

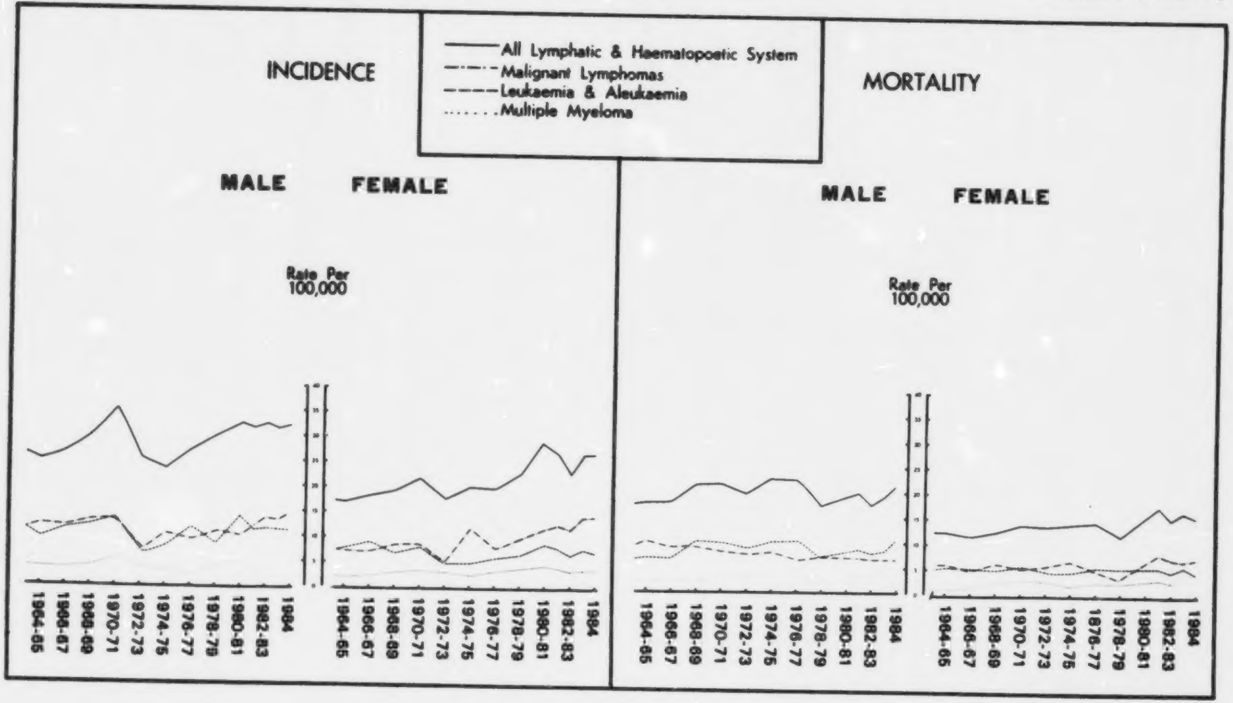


FIGURE 3 (Cont'd.)

ALL SITES

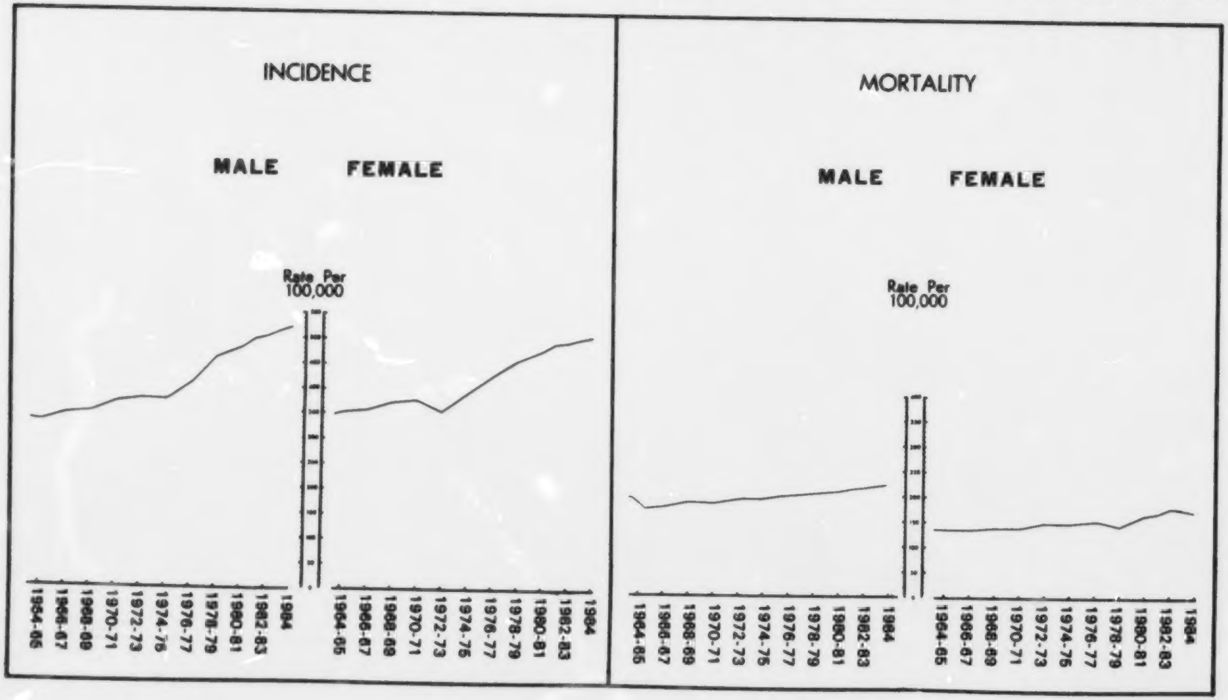
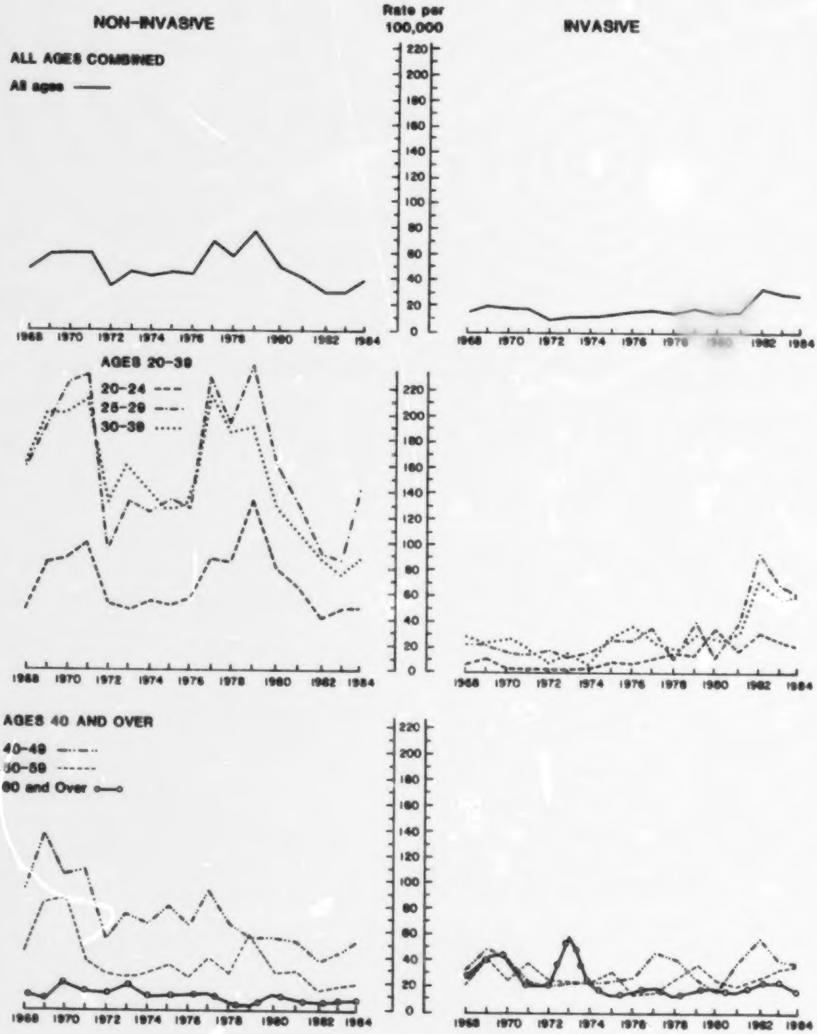


FIGURE 4
TRENDS IN CANCER OF THE CERVIX UTERI IN MANITOBA 1968-1984



GRANTS FOR RESEARCH AWARDED BY THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION FOR 1984 - 1985

OPERATING GRANTS

Epidemiology and Biostatistics
Choi, N. W.
An International Collaborative Study on Cancer of the Pancreas.

Medical Physics
Dunscombe, P.
C. T. and Radiotherapy in the Treatment of Bronchogenic Carcinoma.

Medical Physics (M.C.F.) and Radiology (U. of M.)
Lee, T. Y. and Greenberg, I. D.
Application of Brain Modelling to Dynamic Radionuclide Studies.

Manitoba Institute of Cell Biology
Israels, L. G.
Vitamin K Deficiency Protects the Fetus by Regulating the Mixed Function Oxidase System.
Mowat, M. R.
Molecular Genetic Studies of Friend Virus Induced Erythroleukemia.
Schacter, B.
Investigation of the Effects of Murphy-Sturm Lymphosarcoma on Hepatic Microsomal Electron Transport System Function.

EQUIPMENT GRANTS

Manitoba Institute of Cell Biology
Johnston, J. R.
An Evaluation of the Cellular and Molecular Pharmacology of New Anthracyclines.
Paraskevas, F.
Refrigerated IEC DRR 600 Centrifuge.

AWARDS

Career Investigators
Begleiter, A.; Mowat, M.
Postdoctoral Fellowship
Cheng, C. W.
Studentships
Chan, A. K. M.; Kniel, G. E.; Miller, L. P.; Therrien, P. B.

AUDITOR'S REPORT
TO THE MEMBERS
FOR THE YEAR ENDING
MARCH 31, 1985

Coopers
&Lybrand

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telex 07-55218

a member firm of
Coopers & Lybrand (International)

May 31, 1985

AUDITORS' REPORT TO THE MEMBERS

We have examined the balance sheet of The Manitoba Cancer Treatment and Research Foundation as at March 31, 1985 and the statements of revenue and expense and surplus of the general account, clinical investigation account transactions and the statement of research fund transactions for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the Foundation as at March 31, 1985 and the results of its operations for the year then ended in accordance with the accounting principles as set out in note 1 to the financial statements, applied on a basis consistent with that of the preceding year.

Coopers & Lybrand

CHARTERED ACCOUNTANTS

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

BALANCE SHEET AS AT MARCH 31, 1985

ASSETS

	1985 $	1984 $
	GENERAL ACCOUNT	
Cash and term deposits	940,366	713,628
Amounts owing by the Manitoba Health Services Commission	131,992	212,235
Amounts owing by the Province of Manitoba	52,443	52,145
Accounts receivable	33,943	16,106
Inventory of supplies - at cost	40,541	23,310
Prepaid expenses	7,159	5,986
Equipment - at nominal value (note 1)	1	1
	1,206,445	1,023,411
	CLINICAL INVESTIGATION ACCOUNT	
Cash and term deposits	289,378	327,614
	RESEARCH FUND	
Cash	60,746	55,080
Accounts receivable and accrued interest	248,362	205,544
Investments - Schedule A	4,365,953	3,930,101
	4,675,061	4,190,725

SIGNED ON BEHALF OF THE FOUNDATION

Member

Member

LIABILITIES

	1985 $	1984 $
Accounts payable and accrued liabilities	625,993	497,331
Term bank loan (note 2)	76,650	105,450
Surplus	503,802	420,630
	1,206,445	1,023,411
Commitments payable	289,378	327,614
Accounts and grants payable	108,432	179,077
Research fund	4,566,629	4,011,648
	4,675,061	4,190,725

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

GENERAL ACCOUNT

STATEMENT OF REVENUE AND EXPENSE AND SURPLUS

FOR THE YEAR ENDED MARCH 31, 1985

	1985 $	1984 $
REVENUE		
Manitoba Health Services Commission	7,026,988	5,956,542
Province of Manitoba	186,168	178,564
Recoveries from other institutions	61,710	62,222
	7,274,866	6,197,328
EXPENSE		
Operating expenses -		
Salaries and benefits	5,145,494	4,696,265
Building occupancy	612,825	636,062
General expenses	301,231	265,079
Supplies and other departmental expenses	224,051	210,553
Diagnostic services	166,674	166,486
	6,450,275	5,974,445
Equipment purchases (note 1)	805,694	213,861
	7,255,969	6,188,306
EXCESS OF REVENUE OVER EXPENSE	18,897	9,022
OTHER INCOME, net	64,275	54,346
SURPLUS FOR THE YEAR	83,172	63,368
SURPLUS - BEGINNING OF YEAR	420,630	357,262
SURPLUS - END OF YEAR	503,802	420,630

Coopers
&Lybrand

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

STATEMENT OF CLINICAL INVESTIGATION ACCOUNT TRANSACTIONS

FOR THE YEAR ENDED MARCH 31, 1985

	1985 $	1984 $
RECEIPTS		
Grants received	929,161	1,053,182
DISBURSEMENTS		
Breast screening study	245,918	283,433
Researcher and support staff	165,364	124,061
Physics research and development	85,932	31,844
Terry Fox career awards	79,473	100,072
Physics of light transmission in breast lesion detection	75,210	58,406
Outreach program study	62,937	75,106
Lethal heating of tumour cells feasibility study	44,692	42,193
Breast cancer adjuvant studies	44,345	71,624
Lonidamine - hypernephroma	32,834	4,447
Coordinator of volunteer services	26,891	14,037
Research material	20,300	56,126
Organ imaging	12,712	375
Studies of lung cancer	10,973	-
Studies on pancreatic cancer	7,067	3,389
World Health Organization "Study of Cancer of Cervix"	6,086	3,321
Other studies	46,663	131,228
	967,397	999,662
EXCESS OF RECEIPTS OVER DISBURSEMENTS (DISBURSEMENTS OVER RECEIPTS)	(38,236)	53,520
COMMITMENTS PAYABLE - BEGINNING OF YEAR	327,614	274,094
COMMITMENTS PAYABLE - END OF YEAR	289,378	327,614

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THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

STATEMENT OF RESEARCH FUND TRANSACTIONS

FOR THE YEAR ENDED MARCH 31, 1985

	1985			1984
	Unrestricted $	Restricted $	Total $	Total $
REVENUE				
Donations - Schedule B	276,445	141,881	418,326	617,642
Investment income	538,568	5,473	544,041	434,085
	815,013	147,354	962,367	1,051,727
EXPENSE				
Cell Biology	86,931	45,393	132,324	190,751
Research grants and personnel awards	273,120	-	273,120	-
Hyperthermia project	-	-	-	190,440
Miscellaneous	1,942	-	1,942	2,394
	361,993	45,393	407,386	383,585
EXCESS OF REVENUE OVER EXPENSES	453,020	101,961	554,981	668,142
FUND BALANCE - BEGINNING OF YEAR	3,844,937	166,711	4,011,648	3,343,506
FUND TRANSFER	41,260	(41,260)	-	-
FUND BALANCE - END OF YEAR	4,339,217	227,412	4,566,629	4,011,648

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THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

NOTES TO FINANCIAL STATEMENTS

FOR THE YEAR ENDED MARCH 31, 1985

1. SIGNIFICANT ACCOUNTING POLICIES

General Account

Basis of presentation

The financial statements have been prepared in accordance with generally accepted accounting principles except that annual expenditures for equipment acquisitions are charged directly to operations.

Revenue

Revenue received from the Manitoba Health Services Commission for net insured patient costs is based on operating budget amounts approved annually and adjusted for amounts to be returned to or recovered from the commission in respect of surplus or deficit arising in the current fiscal year.

Surplus and deficit

The Foundation is entitled to retain surpluses arising from excess of revenue over approved expenses for each fiscal year up to a maximum of 2% of the net insured patient costs. Any surplus amount in excess of the maximum is returned to the Manitoba Health Services Commission.

The Foundation may recover deficits arising from excess of approved expense over revenue by making application to the Manitoba Health Services Commission.

Clinical Investigation Account

Basis of presentation

The Clinical Investigation Account segregates grants received for specific clinical research projects undertaken by the Foundation. Grants received and disbursements made are recorded on a cash basis. In general, the term of these projects varies from one to three years.

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

NOTES TO FINANCIAL STATEMENTS

FOR THE YEAR ENDED MARCH 31, 1985

1. SIGNIFICANT ACCOUNTING POLICIES (cont'd)

Research Fund

Investments

Investments are recorded at cost with any premium or discount being amortized over the term of the investment.

Investment income is recorded on the accrual basis.

Grants

Grants are included in the expenditures of the Research Fund in the year they are approved.

2. TERM BANK LOAN

	1985 $	1984 $
Term bank loan with interest at the bank's prime rate, repayable monthly at $2,400 plus interest, maturing 1987	76,650	105,450

SCHEDULE A

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

RESEARCH ACCOUNT

SCHEDULE OF INVESTMENTS AS AT MARCH 31, 1985

	Book value $	Market value $
Bonds and debentures -		
B.C. Telephone Company -		
9 7/8%, November 1, 2003	50,000	40,300
Bell Canada -		
10 1/2%, July 15, 1985	250,000	250,000
Government of Canada -		
13%, June 1, 1987	299,800	310,500
10 1/2%, March 15, 1988	349,750	345,600
12 1/4%, November 1, 1989	100,000	103,000
9 1/4%, May 15, 1997	200,000	169,000
Investors Group Debentures -		
9 7/8%, October 4, 1998	50,000	41,800
Ontario Hydro Bonds -		
9 1/2%, February 10, 2000	400,000	326,600
Province of Ontario -		
11 1/4%, March 7, 1989	74,719	74,200
Quebec Hydro -		
17 1/2%, March 16, 1987	234,059	338,600
Royal Bank of Canada -		
10%, December 1, 1994	160,000	144,000
Credit Foncier -		
14 7/8%, August 9, 1985	15,000	15,100
16 3/8%, May 10, 1987	15,600	16,200
16%, May - July, 1987	67,275	69,800
13 1/8%, September, 1987	75,000	76,900
12 1/2%, October 22, 1987	25,000	25,400
12 1/4%, November 8, 1987	15,000	15,100
12%, January 7, 1988	15,000	15,100
11 3/4%, February 17, 1988	24,750	25,000
Carried forward	2,420,953	2,402,200

SCHEDULE A
Page 2

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

RESEARCH ACCOUNT

SCHEDULE OF INVESTMENTS AS AT MARCH 31, 1985

	Book value $	Market value $
Brought forward	2,420,953	2,402,200
Deposit receipts and investment certificates -		
Bank of Montreal -		
16 1/2%, July 24, 1986	150,000	150,000
Bank of Montreal Mortgage Corporation -		
16%, July 20, 1987	330,000	330,000
12 1/4%, August 3, 1988	300,000	300,000
Canada Trust -		
11 5/8%, August 25, 1986	100,000	100,000
Canadian Commercial Bank -		
10 3/4%, January 9, 1987	20,000	20,000
Mercantile Bank of Canada -		
9 3/4%, April 8, 1985	100,000	100,000
Montreal Trust -		
10 7/8%, July 28, 1985	200,000	200,000
11 7/8%, August 25, 1986	150,000	150,000
National Trust -		
11 1/4%, December 17, 1986	200,000	200,000
Royal Trust -		
13 7/8%, December 19, 1985	150,000	150,000
14 3/4%, May 1, 1986	10,000	10,000
16 7/8%, June 21, 1987	225,000	225,000
11 1/8%, December 18, 1988	10,000	10,000
	4,365,953	4,347,200

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SCHEDULE B

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

SCHEDULE OF RESEARCH RECEIPTS

FOR THE YEAR ENDED MARCH 31, 1985

	$
UNRESTRICTED DONATIONS	
Donation A. Anderson & Co.	100
In memory of Mr. George N. Andison	2,905
In memory of Margaret G. Balderstone	455
In memory of Mrs. Lois Anne Barnes	200
Estate Henry Bedford	5,407
Donation Mary Jean Bennett	100
In memory of Mr. Rowland H. Best	197
Donations Bike-a-Thon	9,544
In memory of Mrs. Margot Bowen	300
In memory of Mrs. Lillian Brown	522
In memory of Mrs. Jeanne Brygider	110
Estate Amy Cora Buchan	2,356
In memory of Mrs. Anne Bozovy	355
Donation Mrs. K. Cairns	100
In memory of J. Stewart Campbell	1,000
Donation Canadian Reformed Church - Ladies Auxiliary	100
In memory of Mrs. Mary Carey	380
Donation Joyce Cavaghan	100
In memory of Mrs. Shirley L. Charge	185
Donation John & Mary Chekryn	100
Donation Mrs. Emma W. Childe	100
In memory of Mr. William Chimuk	125
Donation Eleanor M. Clarke	100
Donation G. R. Collyer Ltd.	1,000
Donation Continental Grain Co.	100
Donation Frank Cooper	250
In memory of Gladys F. Couch	500
Donation Mr. R. Cousineau	100
In memory of Mrs. Donalda Craig	272
In memory of Mr. Norman D. Cran	513
Donation Mrs. Dorothy Craig	1,000
Estate Olive M. Crookshanks	1,000
Donation Hazel Cumpstone	1,000
Estate Christina A. Curran	4,101
Donation Norman Cuthbert	500
In memory of Lena Czchryn	160
In memory of Mr. Reginald C. Davey	130
In memory of Emeric Deblaire	155
In memory of Mr. Donald C. Dingwall	295
In memory of Gail Ann Dobson	1,384
In memory of Eleanor Downie	100
Donation Miss Laura M. Dunn	100
Carried forward	37,501

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SCHEDULE B
Page 2

THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

SCHEDULE OF RESEARCH RECEIPTS

FOR THE YEAR ENDED MARCH 31, 1985

	$
UNRESTRICTED DONATIONS (cont'd)	
Brought forward	37,501
Donation Laura & Winnie Duvenand	500
Donation W. Duxbury	125
Donation East Kildonan Lioness Club	100
Donation Sara Elias	100
Donation Lila B. Ellis	100
Donation Miss Susana Enns	400
In memory of Mr. George F. Essex	1,008
Donation Miss Elizabeth Evans	250
In memory of Mr. Valentine Fabris	110
In memory of Mike Fedorkiw	1,000
In memory of Marilyn Flood	105
Donation Steve Fonyo Run	808
In memory of Terry Fox	375
In memory of Mrs. Victoria A. Franklin	708
Donation Miss Isobel A. Fraser	100
In memory of Hilda Friesen	100
In memory of Mrs. Miriam Finkleman	117
In memory of Mrs. Patricia H. Galpin	295
In memory of Mrs. Marilyn Gardewich	125
Donation General Monash Branch #115	100
Donation Genstar Employees Charitable Fund	150
Estate Frances Gilbert	31,876
Donation Sisters of the Good Shepherd	200
Donation Justina Goossen	100
In memory of John J. Goring	220
Estate Evelyn Grace Goudie	52,500
Estate Charlotte Greenstone	10,000
Donation Miss Elizabeth Grierson	1,000
Donation Ernst Gross	100
Donation Guaranty Trust Co. of Canada	200
In memory of Clare Hanna	200
In memory of Mr. Michael Harasyn	385
In memory of Mr. Steve Harasyn	280
In memory of Iris L. Hawkinson	157
In memory of Mr. & Mrs. W. Hayton	100
Donation Miss G. Shirley Hehn	100
Donation Margarite Henrikson	100
Donation Mrs. Lisa Hogg	500
In memory of Rene Igniti	131
Donation Imperial Veterans in Canada Branch #84	300
Carried forward	142,626

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SCHEDULE B
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THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

SCHEDULE OF RESEARCH RECEIPTS

FOR THE YEAR ENDED MARCH 31, 1985

	$
UNRESTRICTED DONATIONS (cont'd)	
Brought forward	142,626
In memory of Mr. John J. Inglis	403
In memory of Charlotte Isaac	245
In memory of Mrs. T. G. Jackson	100
In memory of Mrs. H. Ann Jason	173
Estate Bertram Monnington Jones	432
In memory of Mrs. Mary Karphshin	350
Donation Joseph H. Kerr	100
In memory of Violet C. Kellas	100
Donation J. H. Kerr Winnipeg Musicians Assoc.	100
Estate B. Kettlewell	500
Estate George P. Kirby	2,500
In memory of Mrs. Bernice Keenan	135
Donation St. James Kiwaniannes	100
Donation Ralph Klady	100
In memory of Mrs. Mary Klassen	250
In memory of Fred Kohler	100
In memory of Mrs. Sara Knacker	113
In memory of Mr. Charles Kroft	2,211
In memory of Stephanie Kruk	160
In memory of Josephine M. Letvak	535
Donation Mr. & Mrs. Howard Levi	100
In memory of Mr. Alex Lloyd	155
Donation Mrs. Winnifred Lucas	1,000
Donation Mr. & Mrs. P. N. Lyons	100
Estate Annie M. McCrea	6,813
In memory of Mr. Donald J. McDonald	100
In memory of Murdo McDonald	100
In memory of Angeline S. McEachern	100
In memory of Mary M. McGrath	105
In memory of Mr. John McGregor McIntyre	155
In memory of Mrs. Ethel McIvor	270
In memory of Alexander McKay	130
Donation Mrs. Hazel McKinley	200
Donation Miss C. M. McLennan	100
Donation Mrs. Violet McLennan	100
In memory of Helen Magnusson	220
Donation Esther Maizlen	400
Donation Dr. A. S. Majury	500
Carried forward	161,981

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SCHEDULE B
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THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

SCHEDULE OF RESEARCH RECEIPTS

FOR THE YEAR ENDED MARCH 31, 1985

	$
UNRESTRICTED DONATIONS (cont'd)	
Brought forward	161,981
Donation Manitoba Hydro Employees Charitable Donations Fund	900
In memory of Mary Mascioli	100
In memory of John Meder	110
In memory of Anna Merrells	200
Donation Mrs. A. Merrells	200
Donation Miss E. Mitchell	550
In memory of Barbara Mogul	100
In memory of Hunte Wong Moon	180
Estate Peter Moroz	375
In memory of Mr. Morris Morrison	385
Donation Mr. Morris Morrison	150
Donation Mrs. Ruth Mozel	100
In memory of Jessie Wilma Muir	378
Donation Municipalite Rurale De Tache	200
Donation Dr. W. S. Neal	100
In memory of Mrs. Hazel Norquay	320
In memory of Mr. & Mrs. [illegible]njamin Oakden	537
In memory of Mrs. Jane [illegible]dleifson	215
In memory of Russel Oh[illegible]	100
In memory of Rose Olynyk	100
In memory of Mrs. Elsie E. Parsons	346
In memory of Mr. Pateryko	100
In memory of Mrs. Rose Pavlick	135
Donation Joseph Pereira	100
In memory of Mrs. Audrey Perry	120
In memory of Joseph Poborsa	195
In memory of Mr. Nestor Podolsky	185
Donation George Pydee	100
Donation Therese Ramachers	200
Donation Miss J. F. Rettie	125
In memory of Mr. Perry Robinson	1,890
In memory of Violet O. Robson	2,000
In memory of Mrs. Laura Ross	155
Donation Mr. J. Ruppel	200
In memory of Stella Sandstrom	100
Donation Michael & Mary Sarak	100
In memory of Talma Schacter	725
In memory of Mrs. Genevieve Schram	1,000
Carried forward	175,057

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SCHEDULE B
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THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

SCHEDULE OF RESEARCH RECEIPTS

FOR THE YEAR ENDED MARCH 31, 1985

	$
UNRESTRICTED DONATIONS (cont'd)	
Brought forward	175,057
In memory of Mr. Reinhold Schwartz	227
In memory of Mr. Dennis Seabourne	348
Donation Mr. William Senkiw	100
Estate Mrs. B. Sheppard	500
Donation L. S. Shewman	240
In memory of Mr. Hymie Shore	183
Donation Mr. & Mrs. W. J. Simons	250
Donation Mr. A. Sitar	100
In memory of Mr. John Smilenski	120
Donation Doris O. Smith	100
Donation Miss Helen M. Smith	150
In memory of William A. Smith	195
Donation William Smith	200
Donation Standard Aero Ltd. Employees Charitable Donation Fund	800
In memory of Mrs. L. Adeline Steele	100
In memory of Tony Stefanyshyn	270
In memory of Nancy M. Stephens	310
In memory of David E. Stoddart	100
In memory of Ethel Johnson & H. G. Storgaard	145
Estate Clara Sutherland	1,104
Donation Ramon Szkroba	100
In memory of Miss Ann Tate	235
In memory of Mrs. Florence Thatcher	328
In memory of Mrs. Bernice Thompson	100
Donation Jeannette Thompson	500
Donation E. R. Thompson	100
Donation Douglas Tripunovir	100
Donation Hon. G. E. Tritschler	1,000
Donation Ukrainian Canadian Veterans	642
Donation Ladies of the Universal Craftsman Council of Engineers	100
University of Manitoba - research equipment	37,605
In memory of Catherine Van de Walle	510
Donation Mr. O. Van De Wiebe	1,000
In memory of Mr. Morris Vickar	676
Donation Mr. E. Wachal	150
In memory of Mrs. Jean R. Watt	150
Donation Wholesale Heating & Plumbing	200
Donation Willing Helpers - North Kildonan Mennonite Church	100
In memory of Mr. William Willis	972
Carried forward	225,167

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THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

SCHEDULE OF RESEARCH RECEIPTS

FOR THE YEAR ENDED MARCH 31, 1985

	$
UNRESTRICTED DONATIONS (cont'd)	
Brought forward	225,167
Donation Retired Doctors, Assistants & Clerical Staff of Winnipeg Clinic	400
Winnipeg Foundation -	
In memory of Samuel & Essie Badham	2,300
George Gordon Estate	726
Harry Little Family Fund	650
Estate Thomas William & Anna Ronald Lowe Memorial Fund	2,033
Percival & Evelyn Pocklington Estate	8,000
Donation Lewis & Pearl C. Roth	3,634
Donation Samuel & Sally Stern & Son Ronald	999
Frank Topper & Emma Topper Memorial Fund	2,537
Bequest of Joseph Wolinsky	450
In memory of Mr. David Wintrobe	250
Donation Mary A. Wladyka	150
In memory of Phillip Wong	200
In memory of Mr. Walter Wozniak	200
In memory of Albert Zeemel	100
Other memorial contributions and donations in amounts of less than $100	28,649
	276,445

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SCHEDULE B
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THE MANITOBA CANCER TREATMENT AND RESEARCH FOUNDATION

SCHEDULE OF RESEARCH RECEIPTS

FOR THE YEAR ENDED MARCH 31, 1985

	$
RESTRICTED DONATIONS	
Donation Canadian Cancer Society	21,180
In memory of Mrs. Alice Christie	3,040
David M. Copp Memorial Fund	62,201
Donation East Kildonan Lions Club	12,909
In memory of Mrs. Hilda Geary	574
Donation Miss Helen Kane	1,000
Donation Kiwanis Club of Winnipeg Foundation Inc.	17,669
Donation Ms. P. Lemiuk	100
Donation Manitoba Paramedical Association	100
Donation D. Marshall	25
Donation Reimer Express Lines Ltd.	10,000
Donation Mrs. Claire Rosenberg	1,000
In memory of Mr. Edward Rosenblat	4,985
Donation W. S. Rowland	150
Gwendolyn & Joseph Sector Fund	5,000
Donation Joseph Sector	506
In memory of Mr. Robert W. Stevenson	1,342
Donation Winnipeg Police Association	100
	141,881

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